ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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The Standard Current Protector.

In case of a "cross" or contact between an electric light wire and a telephone line, more or less of the powerful electric light current would be deflected to the telephone line. When the electric light circuit is run in metallic circuit, and is well insulated, only a small portion of the current could be taken off by the contact of a single grounded telephone line; but if the electric light wire be broken, and one end crossed with a telephone line, while the other end is grounded, the full current supplied by the electric light dynamo would be forced through the telephone line. Such current has sufficient heating power, when flowing through the fine wire of telephone instruments, to destroy them at once, with possible danger to persons and property in the vicinity. Several accidents having been attributed to this cause, it is important to ascertain the amount of damage likely to result from an electric light cross, and to determine upon a satisfactory form of protector.

The American Bell Telephone Company has made an elaborate and exhaustive series of experiments in this direction in the laboratory of their mechanical department at Boston, under the supervision of E. T. Gilliland. A heavy copper loop was run to a neighboring electric light station, where it could be connected with any sized dynamo desired. A special telephone line was also erected for the purpose of sending orders promptly. In the laboratory, several miles of small iron wire wound on drums furnished resistance to represent six independent telephone lines. The usual telephonic apparatus was provided at one end of these lines, to represent subscribers' stations, and annunciator drops of different patterns represented a central office at the other end. All the lines passed through a cable at the central office end. These experimental lines were arranged so that one of the electric light wires could be crossed with them at several intermediate points, while the other electric light wire was grounded. In this way the whole of the electric light current was forced to pass through the telephone lines, the most severe condition which could occur in practice.

Experiments tried upon these lines when no protectors were in circuit, showed that the danger of the electric current has not been exaggerated. That so few accidents are reported from this cause is doubtless owing to the care with which electric light wires are insulated and put up.

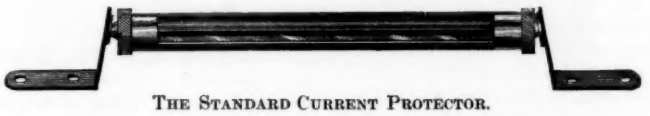
The experiments upon the various protectors submitted to the company for test were very interesting, but cannot be recorded at length. The production of electric arcs of over a foot in length, and the evolution of quantities of ozone, were the frequent and startling result of the tests.

Strong current protectors may be placed in one of two general classes, according to the principle of their action.

The first class comprises those protectors which employ a fusible wire or strip of foil to open the line on passage of a dangerous current. These protectors are destroyed if subjected to a strong current, and must be renewed.

The second class have an electro-magnet of low resistance, which shunts the dangerous current around the telephone or other instrument to be protected. These protectors are generally automatic in their action, restoring the circuits to their normal condition upon the stoppage of the strong current.

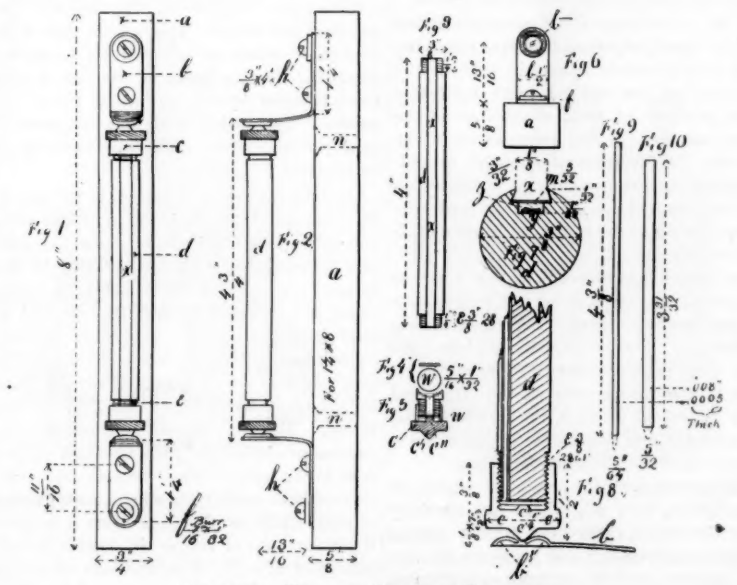
There are several serious objections to the protectors of the second class. They introduce a magnet into the circuit; they require a very perfect ground connection; are liable to get out of order, and are expensive. The protectors of the first class are open to none of these objections, and are undoubtedly much to be preferred.



THE STANDARD CURRENT PROTECTOR.

Of this class is the "Standard Current Protector," designed by Theo. N. Vail, the general manager of the American Bell Telephone Company, and manufactured by the Western Electric Company. The accompanying cuts illustrate the protector, and give the working details. The thinnest tin-foil is used as the fusible conductor, since this is found to be the most suitable material. The conditions of the case require the fusible conductor to be of greater resistance per unit of length than the finest wire used in telephone instruments, and it must melt at a low temperature, in order to avoid igniting any combustible substance in its vicinity. No wire is to be had which answers these conditions, but thin tin-foil is exactly what is required. For convenience in handling, the tin-foil is mounted upon cloth or paper, which is preferably of a red color in order to expose any break or defect in the tin-foil. The tin-foil, thus mounted, is cut into strips four inches long and $\frac{5}{64}$ of an inch wide, having a resistance of about one ohm. A slot cut in a round rod of hard rubber receives one of these tin-foil strips. A strip of mica is slipped into the slot above the tin-foil, and serves several useful purposes. Being transparent, it permits a ready inspection of the tin-foil strip for breaks; and being nearly indestructible, it protects the foil from mechanical injury and prevents the formation of an arc from the electric light current. The tin-foil strip is long enough to allow the ends to be bent over the ends of the hard rubber rod. Brass washers are laid upon the ends of the tin-foil, and brass caps, screwed down upon these washers, make an electrical connection with the tin-foil, and complete the protector itself. Two spring clips of brass, screwed upon an insulating base, hold the protector in position. The protector may be slipped in or out of place very easily, and furnishes a convenient place for opening and testing the line, since the protectors are inserted both at the central office and the subscriber's station.

The "Standard Current Protector" was thoroughly tested before being placed in the market, and it has come into quite extended use in the few months which have elapsed since its introduction.



SECTIONAL VIEW OF CURRENT PROTECTOR.

— Speaking of dust explosions, a case from Germany is worthy of notice. A sack of flour, falling downstairs, opened and scattered the contents in a cloud through the lower room, where a burning gas flame set fire to the dust, causing an explosion which lifted a part of the roof of the mill, and broke almost all the windows. There can be no doubt that the majority of dust explosions are, like mine disasters, due to open lights; and as this danger can be practically avoided by the use of the incandescent electric light, there really seems to be no valid reason why it should not be introduced more generally, as those establishments using it express themselves in its favor.

Electrolytic Refining of Copper.

A long article or essay on the above subject has just appeared in the German *Berg- und Huttenmannische Zeitung*, written by Dr. Martin Kiliani, of Munich, who has previously published several very interesting communications on electro-metallurgy, and who is himself the patentee of a process for the extraction of zinc

This article cannot fail to be of considerable interest to all who are desirous of understanding the principles concerned in the electro-metallurgy of the copper. We have, once or twice, in notes on the subject, alluded to the great secrecy with which those works now employing the process continue to surround the matter. Dr. Kiliani alludes also to this in the case of the German works, and speaks of this secrecy with considerable impatience. He says that its effect has been to some extent to make people believe that the operations carried on are based upon discoveries only known to a few, and are surrounded by difficulties of a very special and complicated nature. He writes the article now in question with the object of dissipating this wrong impression, and of convinc- all those interested in the subject that whatever is done inside these works can be done by anybody who gives a little attention and study to the subject, the only "secrets" being slight and immaterial details of practice. He commences by a slight review of the history of the subject, and gives to Maximilian, Duke of Leuchtenberg, the honor of being the first discoverer of the fact that by electrolytic action an impure copper containing precious metals can be refined so as to yield pure copper, and leave the precious metals in a concentrated form ready for further treatment. This was in 1847, and the chemist in question not only discovered the fact, but went a considerable way in investigating and explaining the various principles and reactions concerned. He also appreciated the very important bearing this discovery might eventually have on practical metallurgy.

But nothing further came of it, practically speaking, till it was taken up by Elkington, in England, who took out patents about 1865, not limiting himself to the refining of impure metallic copper, but including in his operations also the sulphide of copper, or copper regulus. This was prepared in the usual manner by smelting copper ores, which was cast into slabs for use as anodes in the baths of copper sulphate. Rods of copper were cast into the regulus slabs to serve as supports and conductors, and these rods were themselves protected from the action of the solution by coating them with wax. Dr. Kiliani describes Elkington's arrangements, and states that with three Wilde machines the production of pure copper was at first 200 to 250 kilos per 100 baths per 24 hours, and that in 1878 Elkington's plant produced six tons per week.

But however simple this process seems in outline, says the author, there are many points which would bring great difficulties to an inexperienced person attempting the use of it, if he desired to get, not only silver and gold, but also a good quality of copper. These points depend on the presence of such impurities as arsenic, antimony, bismuth, etc., and on the necessity of carefully observing certain conditions as to strength of

current, composition, and circulation of the solution, etc. Elkington, in his patents, does not deal with these points, and this is perhaps the reason, together with the lack of suitable dynamo-machines, why the electro-metallurgy of copper did not make much progress beyond Elkington's works till within the last few years. It is really only during the last decade that the immense progress of electro-technics has extended also to metallurgy and enabled great successes to be realized in the working of copper, and opened up the prospect of equal successes in other directions.

The two most successful recent examples of the application of electrolysis to the metallurgy of copper in Germany, are the Hamburg refinery, working with Gramme machinery, and the copper works at Oker, in the Hartz, where a very extensive plant has been fitted up by Siemens and Halske, of Berlin. These are the two works specially alluded to by the author in his remarks about secrecy.

Proceeding to examine into the nature of the process itself, Dr. Kiliani begins by saying that the basis of the whole matter consists in the simple fact that when an alloy of several metals forms the anode in a bath, the electric current does not cause the solution of all the component metals at the same time, but that it makes a selection and takes one metal after the other in a certain order; and similarly when several metals are in solution in a bath the current selects them in a certain order for deposition on the cathode. A fully satisfactory scientific explanation of these facts cannot, according to the author, be attempted, because the whole matter is even yet too little studied, and the materials for a full explanation have not yet been collected. Even as concerns the order of this solution and deposition, there are only full materials published concerning silver, copper, iron, zinc and lead, and then only so far as concerns some few electrolytes. About those elements which are specially troublesome and important in the metallurgy of copper, arsenic, antimony, bismuth, etc., the published information is very superficial and scanty, and in some instances quite incorrect.

The author then states that "the selection of the different metals takes place in general, on the principle that as much energy as possible is created ('erzeugt'), and as little energy as possible is consumed." That is to say, under conditions to be explained later on, that metal will be first dissolved from the anode, the solution of which causes the development of the greatest amount of energy (electromotive power); and that metal will be first deposited from a solution on to the cathode, the separation of which requires the least consumption of this same energy.

A comparative measure of the energy required in these cases is obtained by taking the heat of combination of the metals with oxygen to form oxides or salts. The combination heat of the metals with oxygen to form oxides is taken by the author to form a tabular list in the order in which they are dissolved, as follows: Manganese, zinc, iron, tin, cadmium, cobalt, nickel, lead, arsenic, bismuth, antimony, copper, silver, gold.

Of this list it may be said that all those metals which precede copper, when they are present in the anode as metals (not oxides) together with copper, will be attacked by the current before the copper, whereas silver and gold will only be dissolved after the copper, or if they are present in very small amount, they will fall from the anode as powder, and be found in the "mud" of the bath. In practice this order is fully maintained, and all the above metals dissolve before the copper, and are found in solution in the electrolyte, unless they form insoluble compounds, for example, with lead when the bath is a sulphate, as in refining copper. When the metals are once in solution, their deposition on the cathode takes place in reverse order, beginning with gold and ending with manganese. But the correctness of these rules is dependent upon several conditions which must be observed in order that the work may go on in a normal manner. The chief of these conditions concern the strength of current, the nature and concentration of the electrolyte, the proportions of the metals alloyed together in the anode, and the physical condition of the anode itself.

If the current exceeds a certain strength, all the metals may be dissolved and deposited together. The more neutral the electrolyte is, the more easily will the more electro-negative metals be dissolved, and the more easily will the more electro-positive metals be deposited. The same may be said of the electrolyte, the poorer it is in copper in solution. If the anode consists of copper containing a large amount of impurities, these will be dissolved more easily than from a copper containing but little impurity. The less dense and compact the anode is, the better the process will go on.

This all applies only to copper containing the other metals in the metallic form. If oxides or sulphides are present, the first question is as to their conductivity for the current. Most oxides may be classed as non-conductors under the conditions of the bath, and have nothing to do with the action of the current, they simply go into the insoluble mud, or are dissolved by the purely chemical action of the electrolyte.

The sulphides are mostly good conductors, but not nearly as good as metallic copper. If therefore but a small amount of sulphides is contained in the copper of the anode, the current will act only on the copper, and the sulphides will be found in the mud unacted upon, unless by the acid of the bath. If much sulphide is contained in the copper, the current will be more or less divided between copper and sulphide, and a portion of the latter will be decomposed with separation of sulphur.

In addition to the above secondary reactions of the bath, there are also others, some of which are good and some bad, for conducting the process. The current is always striving to decompose the electrolyte into metal (or oxide) and acid; whilst this liberated acid is striving to re-dissolve the deposited metal or oxide. These two forces are always opposed to one another, and under varying conditions either may gain the upper hand. The resolvent action of the acid, in cases where the components of the electrolyte have a strong chemical affinity, may overpower the action of a weak current.

In the case of copper this secondary action is not of much importance, copper not being acted upon by dilute sulphuric acid in the absence of air, but still it is quite noticeable in the presence of good circulation of the liquor, and more or less access of air in the cathodes. A favorable effect of this secondary action is, that any cuprous oxide which may be deposited at the cathode with the copper, owing to the weakness of current, is dissolved again.

The author then proceeds to give a list of the special impurities to be met with in copper, and the behavior of each of these during electrolysis. These statements are based upon a very extensive series of experiments made in the laboratories of the Technical High School at Munich, the author having for a long time paid very special attention to electro-metallurgy in all its branches.

The experiments, the results of which are given below, were all, where not specially otherwise stated, carried out with a normal electrolyte containing 150 grammes of copper sulphate, and 50 grammes concentrated sulphuric acid per liter.

The normal current used, the author expresses by the formula:

$$20 \frac{\text{amperes}}{\text{square meters.}}$$

Cuprous Oxide.—Cuprous oxide, being a bad conductor, is not affected by the current, and goes first of all into the mud of the bath. It is then, however, dissolved by the free acid, more or less according to the time the mud is allowed to remain in the tank. Therefore, any cuprous oxide contained in the anodes diminishes the free acid of the electrolyte, and increases the amount of copper in solution.

Sulphide of Copper.—If the amount of this does not exceed that usually present as impurity in "black copper," and especially if it is all present as cuprous sulphide (Cu_2S) which is non-conducting, it all goes into the mud, from which no free sulphur can be extracted by carbon disulphide. If the copper sulphide is present to the extent of a considerable percentage of the anode, it is decomposed with liberation of sulphur.

Silver, Gold, Platinum.—These are all left undissolved in the mud as long as they are not present in considerable quantity, and as long as the liquor retains its proper normal composition as to free acid and dissolved copper. If the liquor gets to be neutral, silver is soon dissolved, and is then, of course, deposited with the copper on the cathode.

Bismuth and Oxide of Bismuth.—These go partly at once into the mud as insoluble basic salt, partly into solution, from which they then eventually precipitate as basic salt. Thus the presence of metallic bismuth in the anode causes the liquor to become poorer in copper, while the presence of oxide of bismuth causes a reduction in the amount of free acid. No bismuth was found at the cathodes, even in cases where large quantities of the basic salt had already deposited in the mud, so long as the bath was kept in its normal condition as to copper and acid.

Tin.—This is dissolved in the bath, and after some time is partly precipitated again as basic salt. If the anode contains very much tin, the greater part remains as basic sulphate, adhering to the anode itself. This deposit on the anodes is a dirty light gray in color when moist. It is white when air dried, and increases rapidly in weight, even after long drying at 100 deg. Cent. It contains sulphuric acid, and the tin oxide in it is mostly of the variety soluble in hydrochloric acid, the variety insoluble in that acid being present only in small amount. The presence of tin, therefore, lowers the amount of copper in the bath without replacing it by any appreciable amount of tin in solution. It also, in consequence of the separation of basic salts, increases the amount of free acid, but only to a slight extent. The tin in solution exercises a surprisingly favorable influence on the copper deposit on the cathode. Copper precipitated from a neutral solution of pure copper is obtained in a rough, irregular, and brittle form, but if the copper contains tin, the deposits are excellent and tough. This was the case with deposits in which no trace of tin could be detected. The resistance of the bath is also much reduced by the presence of tin in the anodes. This action of tin does not seem to be as yet understood sufficiently to admit of an explanation.

Arsenic.—Arsenic, if present in the metallic form, goes into solution as arsenious acid, and only appears in the mud when the solution is saturated with it. Arsenic in the form of arsenic acid, combined with oxide of copper, or other oxides, is deposited as mud at once in neutral solutions, as these oxide combinations are non-conductors. In acid solutions arsenic acid is slowly dissolved by secondary action of the acid into the solution. Metallic arsenic thus reduces the amount of copper and increases that of free acid in the bath, because it goes into solution without combining with an equivalent of acid, while at the same time a proportionate amount of copper is deposited with liberation of acid. Combinations of arsenic acid cause a slow neutralization of free acid. Arsenic does not enter into the copper deposit on the cathodes so long as the bath remains normal as to copper and free acid. In a neutral bath, or in one in which the copper in solution is insufficient, arsenic is deposited with the copper.—*London Engineering.*

*** A committee of lawyers has been appointed at Indianapolis to carry a telephone case to the Supreme Court to test the new law reducing rates. An address has been issued to the telephone subscribers asking for funds. The lawyers of Indianapolis are, at least, to be congratulated over the passage of the law.

For Everybody Except Electricians.

A PARAPHRASER'S VIEW.

Man that is married to woman is of many
days and full of trouble.
In the morning he draws his salary, and in
the evening
Behold, it is gone.
It is a tale that is told;
It is vanished, and no one knows whither it
goeth.
He riseth up clothed in the chilly garments
Of the night,
And seeketh the somnambulent paregoric
Wherewith to soothe his infant posterity.
He cometh as a horse or ox
And draweth the chariot of his offspring.
He spendeth his shekels in the purchase of
fine linen
To cover the bosom of his
Family;
Yet himself is seen at the gates of the city
With one suspender.
Yea! he is altogether wretched.

—*Adjutant, "O. G."*

BOB BURDETTE'S VIEW.

Man, born of woman, is of few days and no teeth. And, indeed, it would be money in his pocket sometimes if he had less of either. As for his days, he wasteth one-third of them; and for his teeth, he has convulsions when he cuts them, and as the last one comes through, lo! the dentist is twisting the first one out, and the last end of that man's jaw is worse than the first, being full of porcelain, and a roof-plate built to hold blackberry seeds.

Stone bruises line his pathway to manhood; his father boxes his ears at home, the big boys cuff him in the playground, and the teacher whips him in the schoolroom. He buyeth Northwestern at 110, when he has sold short at 96, and his neighbor unloadeth upon him Iron Mountain at 63⅝, and it straightway breaketh down to 42¼. He riseth early and sitteth up late, that he may fill his barn and storehouses, and lo! his children's lawyers divide the spoils among themselves and say "Ha, ha!" He growleth and is sore distressed because it raineth; and he beateth upon his breast and sayeth, "My crops is lost!" because it raineth not. The late rains blight his wheat, and the frost biteth his peaches. If it be so that the sun shineth, even among the nineties, he sayeth, "Woe is me, for I perish!" and if the north wind sigheth down in forty-two below, he crieth, "Would I were dead!" If he wear sackcloth and blue jeans, men say, "He is a tramp;" and if he goeth forth shaven and clad in purple and linen, all the people cry, "Shoot the dude!"

He carrieth insurance for twenty-five years, until he has paid thrice over for all his goods, and then he letteth his policy lapse for one day, and that same night fire destroyeth his store. He buildeth him a house in Jersey, and his first-born is devoured by mosquitoes; he pitcheth his tents in New York, and tramps devour his substance. He moveth to Kansas, and a cyclone carrieth his house away over into Missouri, while a prairie fire and ten million acres of grasshoppers fight for his crop. He settleth himself in Kentucky, and is shot the next day by a gentleman, a colonel, and a statesman, "because, sah, he resembles, sah, a man, sah, he did not like, sah." Verily, there is no rest for the sole of his foot, and if he had it to do over again he would not be born at all, for "the day of death is better than the day of one's birth."

.... On the 1st of August the Western Union Telegraph office at St. Paul, Minn., will remove from its present location on Minnesota street to new quarters in the German-American Bank Building. The business office will be in a room 30×43 feet, next the side entrance to the elevator and fronting on Fourth street, while the main operating room will be on the top floor of the building, in a room 70×30 feet. The battery room, 45×45 feet in size, is located in the basement, and has a capacity for 10,000 cells. The quarters are a great improvement over the old office, and will be much more convenient, both for the public and the company.

The Victor Turbine.

The Stillwell & Bierce Manufacturing Company, of Dayton, Ohio, have recently completed a long series of thorough experiments with a testing flume at their works, which have resulted in the production of "The Victor Turbine," illustrated in this edition of the REVIEW in which is obtained the maximum capacity of a given diameter of wheel combined with high percentage of useful effect. Several causes are operating to constantly enhance the value of water powers, while at the same time the average supply of water available for manufacturing purposes is steadily diminishing. Many locations which, a few years ago, afforded a supply of water so abundant as to admit of very wasteful use, now demand the most economical water-wheels that can be obtained, and many turbines hitherto regarded as good enough must give place to better ones.

Desiring to meet this demand for a more efficient water motor, this company, some time since, announced their determination to furnish, if possible, the best turbine that science, combined with experience, could produce, and as a result of these experiments and study present "The Victor Turbine."

The remarkable power and high percentage of useful effect developed by it, together with its simple, strong construction and perfect gate, present a splendid combination of excellencies, and which will, no doubt, command the attention of all who desire to obtain at the least cost the largest amount of power from a limited quantity of water.

"The Victor Turbine" is presented solely on its merits, and subject to test, if desired, at purchaser's expense, unless the wheel should fail to perform as guaranteed, in which event the manufacturing company will pay all expenses of testing.

In connection herewith we present an engraving (Fig. 1) illustrating the iron flume, or outer case, such as Stillwell & Bierce use for wheels up to 15 inches diameter. It is made, as the engraving represents, of two castings bolted together, so it can readily be taken apart, and is provided with a movable cap, so that the wheel can be taken out entire, the opening being large enough for that purpose. The flange at side is furnished with bolts ready for connecting either with iron or wood trunk, or vertical pen-stock. The cover is provided with stuffing-boxes for both wheel-shaft and gate-stem, and a bridge-tree firmly bolted on, which affords a good, broad oil-bearing for the upper end of the water-wheel shaft. A hand-hole affords ready access to the wheel for examination, or for removing obstructions. In connection with this flume, an iron draft-tube of any desired length may be used, and a short piece, say, not less than 15 inches, is always necessary. The ring to which the draft-tube is riveted is turned true and snugly fitted to its seat on the inside of flume. The flange of wheel-case is also turned true, and rests upon the face of the draft-tube ring, thus forming an air-tight joint.

In Figure 2 is shown the Victor wheel on its shaft removed from the chute-case. As will be seen, the wheel is different from any other wheel in the market, and presents some decidedly novel features. It receives the water upon the outside and discharges it downward and outward, the lines of discharge occupying the entire diameter of the lower portion of the wheel, excepting only the space filled by the lower end of the shaft. This form of construction secures the maximum capacity of a given diameter of wheel, and also great strength and durability, and the tests reported give proof of its power and efficiency.

In Figure 3 is shown this celebrated wheel as it appears when shipped to customers, ready to set in the flume.

As an indication of the satisfaction the work of the water-wheel of this company gives to electric lighting companies, we publish the following letter, similar to scores of others received:

DAYTON, Ohio, April 21, 1885.

Messrs. Stillwell & Bierce Manufacturing Co., Dayton, Ohio.

GENTLEMEN,—At the time our plant was erected in 1883, we put in four of your 48-inch Victor Turbines for driving the same, since which time we have had them constantly in use. Our head of water varies from 6 to 10 feet, and when we have a full head two of the wheels afford ample power for running six dynamos, furnishing two hundred 2,000-candle-power arc lights, and as our head becomes reduced by back water we use one or both of the remaining wheels, as may be necessary. We find the wheels

FIG. 1.—VICTOR IRON FLUME, WITH WHEEL IN POSITION.

very strong and steady, economical in the use of water, and not affected by back water, and entirely satisfactory in all respects. We think your Victor wheel well adapted for driving electric light machinery.

Very truly yours,
DAYTON ELECTRIC LIGHT CO.
JOHN R. FLETCHER, Manager.

Lightning as a Truth Promoter.

The other night, after the thunder shower, Jones dropped in on a neighbor and found about a dozen people assembled.

"Well, well, you look cheerful after such a close call," growled Jones, as he removed his hat.

"What close call?"

"Why, lightning struck the barn in the alley not a hundred feet away"

"Oh, dear!" said one of the women, "but I knew it. One of my arms has been numb ever since."

"And it affected my foot," said another.

"And it set my heart to palpitating."

"And my elbow has felt queer ever since."

Every one in the room remembered to have been shocked, and every one was thankful over the narrow escape.

By and by a boy, who had been thinking deeply, gushed out:

"Why, there is no barn in the alley!"

Amid the deepest silence everybody remembered this fact, and the boy clinched it with:

"And how could there be, when there is no alley!"

Jones had lied, but so had all the others.

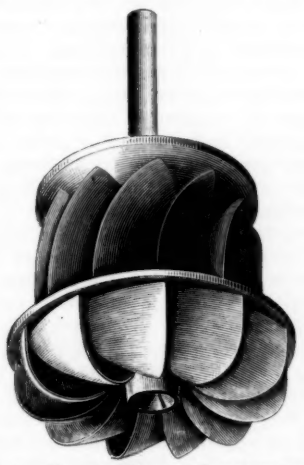


FIG. 2.—VICTOR WHEEL REMOVED FROM ITS CASE.

FIG. 3.—VICTOR WHEEL AND CASE, COMPLETE.

—— An electric front sight for rifles has been patented by Mr. W. Winans, of Brighton, England The invention is designed to overcome the difficulty of shooting in the early morning, when the light is not good enough to see the ordinary fixed sight properly. This temporary front sight consists of a very small incandescent or glow lamp (something like a dentist's), covered mith a metal shield. The shield has a small hole in it through which the light shines, and this spot of light, being turned towards the shooter, is used as the "bead" of the front sight in aiming; a small electric battery in the stock of the rifle generates the electricity for the lamp. The invention promises to be of use to the sportsman, but it will be found, we think, rather a bother in practice.

—— Within the glass shade of a Bridgeport, Conn., electric light two English sparrows have built their nest.

—— Middletown, Conn., has shown its satisfaction with the Schuyler system by an order sent this week to the Schuyler Company for a third machine. This increases the plant in Middletown to about one hundred lights; a pretty good showing for two months' running, where the plant was installed with but orders for less than thirty lights.

—— The Lewiston and Auburn Electric Light Company, Auburn, Me., are running 107 Thomson-Houston arc lamps, and averaging six hours and a half per night. They run two 50 horse-power Armington & Sims Company engines, and one tubular boiler set with the Jarvis patent furnace. They burn 2½ cords of wet sawdust for fuel each night, that costs 75 cents per cord delivered at their station. The cost of power is $2\frac{7}{16}$ mills per lamp per hour.

—— New Britain's appreciation of the Schuyler Electric Lighting system was conclusively shown this last week in the adoption by the city of all the electric lights in the street which had hitherto been paid for by private individuals, and an increase voted by the city government at its meeting, to fifty lights for street purposes. This demands an immediate increase of two more machines for that city for the local company. New Britain is using nothing but the full two-thousand candle-power lights for both its public and private use.

—— The petition of the Brush Electric Light Company asking to be allowed to place their wires underground for incandescent lighting for the use of their patrons on Canal, Custom-house, Royal, St. Charles and Camp streets, is looked upon favorably by the New Orleans council. Mr. Bell, secretary and treasurer of the company, informed the committee that the way in which the wires were to be laid, would be in pipes laid along the inner edge of the sidewalk. The company will give bond to replace the sidewalk in the same condition it was before the wires were laid. Arrangements could be made to light the Council chamber and one committee room, in consideration of the privilege. The tube containing the wires will be about eighteen inches below the level of the sidewalk.

—— A contemporary says: "It would seem that a more perfect electric light than has yet been tried will have to be devised before a large fleet could without great risk of destruction lie at anchor for any length of time in a harbor open to an enemy's torpedo boats. The defensive boom is but a weak protection unless every yard of water can be searched by an almost continuous blaze of electric light, and that must be thrown outside the most advanced line of defence, or it becomes a danger rather than a safeguard. The Mercury proved this in the fight of Monday week, when she much more frequently betrayed the movements of her own boats than succeeded in discovering what others were doing. Occasionally, however, the blinding rays from her lamp were flashed full in the face of the defenders, and that suggested how effectively a light specially contrived might be used to veil the operation of an attacking force. After long exposure to this fierce glare the eyes become so dazzled that they can see nothing for a time, and a clever foe might, in the briefest interval, manage to make a successful dash if she had thus prepared the way for it."

—— The London *Electrical Review* contains the following concerning the incandescent lamp tests at Philadelphia: "Our namesake in New York questions very strongly the reliability of the tests recently carried out by a committee of the Franklin Institute as to the life of incandescent lamps, remarking that if those portions of the results already made public fairly represent the whole, the discriminating public can wait without impatience almost any length of time for the balance, or even hear without a sigh that they will not be made public at all. Our contemporary disclaims any desire to impute unworthy conduct or motives to the committee, but simply believes the results of the lamp tests to be unreliable and misleading, if not absolutely erroneous, worthless; this, it says, may have come from inexperience of the members of the committee, incompleteness of the apparatus or carelessness. We concur in the remark that it is somewhat strange that lamps which have been in use for years alongside of the Edison, without any marked difference in the duration of life, should be found so wanting as is charged in this Franklin Institute manifesto."

Electrical Review.

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GEO. WORTHINGTON, - - - Editor.
CHARLES W. PRICE, - Associate "
LOREN N. DOWNS, - - - President.
C. C. HASKINS, GEO. A. HAMILTON, } Consulting Electricians.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, AUGUST 1, 1885.

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The electric light has found favor in the quaint old city of Venice, and now enhances by its brilliancy the picturesqueness of her numerous beautiful gliding gondolas, as well as lights up many elegant interiors. The inhabitants considered it a sacrilege a few years ago when steam was introduced on the water-ways of Venice, but they finally became accustomed to the innovation, and now are generally accepting the electric light.

Mr. Frank B. Knight, of this city, well known to the electrical people generally, is the possessor of several valuable souvenirs of General Grant, among them two autograph photographs presented to him by the General in person. Mr. Knight was detailed by the Western Union Telegraph Company in the fall of 1868 to receive the messages at Galena announcing to the General his election as President, and out of the large number received several are still in the possession of Mr. Knight, who picked them up from the floor, where the General had thrown them after reading their contents. Mr. Knight, though quite young, was an adept operator, and received many expressions of appreciation from the great soldier.

It is rumored that the electric light companies are becoming tired of expensive litigation, and plans for a better understanding and possible consolidation of interests are receiving attention in those quarters the most likely to bring about the change. At the meeting of the National Electric Light Association, in August, the matter will be discussed, and, no doubt, acted upon.

A new Electrical Exhibition is announced to be held next spring in Paris. It will be organized by the International Society of Electricians, and will be similar to the exhibition at the Observatoire a few months ago, with such extensions and changes that experience may dictate. Electrical experiments and demonstrations will be a special feature. The undertakers already feel assured of the success of the exhibition.

The Electrical Subway Commissioners, of this city, meet every Monday. At the meeting this week, acknowledgments of the circular letter of the Commission giving notice of its organization were received from nearly one hundred corporations. There were also received a number of communications from persons who gave detailed statements of the underground electric systems for which they had patents. Plans will be received by the Commissioners until August 13.

The data connected with his experience in practical electric lighting is one of the things that every delegate to the National Convention should bring with him. The Convention will then be of that practical benefit to all the workers in the field that none need depart feeling that he has not been well repaid for his attendance. Any suggestion or information concerning the meeting, from the electric light people, will be gratefully received by the President, J. F. Morrison, of Baltimore, and will be duly considered by the Executive Committee.

HIS LIFE WAS KNIGHTLY.

The country has lost its most distinguished and beloved citizen, soldier and statesman. It was the belief in olden time that none could see the sacred cup sought by the knights of Arthur's Round Table save he who had been chastened till perfect purity pervaded his being. "In these days we look not for any stainless man, yet, should we search the wide world through, we could not find one whom all men would say had passed through the fiery furnace of greatness with less harm, had trodden the rough road of adversity with more grandeur than this man who has just died." From the day when he entered Vicksburg, past the day when he refused Lee's sword, past the day when he laid aside the robes of state, past the day when the treachery of trusted wretches made him a dependent upon the charity of others, down to the day which ended the long fight with death, he endured praise and blame, he passed through shame and glory with a manliness that made him the first of men. Some high official may die and plunge into perfunctory mourning the land over which he has held authority. But never again in the lifetime of mature men, now standing with throbbing hearts by the grave of Grant, can the country be so deeply stirred by the departure of an American so eminent and so firmly fixed in the affectionate respect of his fellow-men. The death of Grant marks an epoch in the history of the United States. A noble and altogether unique figure in our national life has disappeared from the haunts of living men. He on whom his fellow-countrymen depended with an unshaken confidence in the darkest hours of the Republic is no more. But so long as patriotism dwells among men, so long as manly courage and fixity in lofty purpose are respected, so long as valor and mighty service are held in honor, Grant's name and fame are secure.

General McCooke concludes a letter as follows: "He faced death as he had faced all things in life, with dignity and courage, and when at last the end came, he went to sleep like a tired child, and from the summit of those grand and solemn mountains, hallowed by memories of our fathers' struggles for liberty, the great soul of our hero passed into the beyond, believing that if there had been errors in his life the tears of a sorrowing nation would wipe them for ever from the memory of men and blot them out from the book of God."

STANDARD CELLS FOR ELECTROMOTIVE FORCE.

The recent Paris Congress, among other important work, decided on three standards for the practical measurement of electrical action, the establishment of which was absolutely necessary to substantial progress in electrical science and art.

The *ohm* has been fixed, and copies of the standard have been prepared which vary but slightly from the original.

The *ampere*, which the Congress defined as the current of which the absolute measurement is 10' electro-magnetic units, can easily be practically realized by means of the standard tangent galvanometer, having as we do now a fixed and exact standard of resistance.

But, now we come to the *volt;* to be sure, having the current and resistance measured, we can easily calculate the electromotive by Ohm's law. There are, however, many cases where a standard *per se* is needed, and a cell with a constant, invariable electromotive force has been sought to constitute it.

The Latimer Clark cell has held its place as a standard for a number of years, though there are several serious objections to it, and as we become more refined in our measurements, these defects appear the more glaring. In the first place its electromotive force varies with the temperature of the cell; at 15° C., its electromotive force, 1.442 legal volt. At 15.5° C., Kohlrausch found it 1.433, and Lord Rayleigh, 1.434 volts. Some experimenters have found the coefficient of temperature between 15° and 25° C., from 0.067 to 0.068 per degree, whilst others place it at 0.08. This difference is probably due to a difference in the preparation of the cells by the various experimenters. Again, different elements similarly prepared, but at different times, have been found to vary as much as 10 per cent. The greatest inconvenience of the Clark cell is, that it polarizes as soon as it commences to furnish a current, thus it can only be used with an electrometer. There have been several modifications of the Clark cell. Lord Rayleigh replaced the pure mercury by an amalgam of zinc. The two electrodes are then amalgams of zinc, but the one strong and the other weak. Sulphate of zinc solution constitutes the exciting fluid. As far as can be learned this cell can hardly be called an improvement, and its electromotive force, 0.0058 volt, is rather small to serve as a standard.

A number of experimenters have sought to transform the well known Lodge cell. Kittler uses two glass jars, the one containing a neutral solution of sulphate of copper of 1.19 to 1 20 sp. gr., surrounding a rod of chemically pure copper; the other a rod of chemically pure zinc, and surrounded by a solution of sulphuric acid of 1.075 sp. gr. at 18° C. The two liquids communicate by means of a siphon tube. The electromotive force of this cell is 1.182 legal volt. This element has certain advantages over that of Lodge. The objection to it is that, though easily prepared, it is necessary to prepare it afresh each time it is used, as the fluids will mix through the siphon. M. Rotteu has constructed an element resembling that of Kittler, but instead of using the sulphate of copper solution, he employs a saturated solution of neutral sulphate of zinc. The siphon has in its highest part an opening fitted with a glass stopper. The two end openings of the siphon which dip into the liquids are covered with bladder membrane. The siphon is filled with the same liquid as that in which the zinc is immersed.

The electromotive force of this element is 1.047 volt, and it has given highly satisfactory results.

The most recent of the standard cells is that constructed by Von Beetz, and in addition to the success that has been claimed for it, it possesses the interest of originality. To transform the Clark cell he fills a U-shaped tube having a diameter of a centimeter and a height of 75 centimeters, with a paste of bisulphate of mercury and of a solution of sulphate of zinc, but he boils this paste in a vacuum, till upon cooling it acquires the hardness of stone. The paste, after being thus rendered hard, and at the same time dry, is introduced into the arms of the tube, and then the electrodes are put in place, the mercury on one side and the zinc on the other. The openings are closed with paraffin through which the platinum pole wires pass. Dr. Pfeiffer has found the resistance of this cell to be 15,700 ohms Its initial electromotive force is 1.426 volt On closed circuit the electromotive force fell:

In 5 minutes to 1.424 volt.
In 1 hour to 1.423 volt.
In 4 hours to 1.423 volt.
In 6 hours to 1.421 volt.
In 12 hours to 1.418 volt.
In 48 hours to 1.393 volt.

An element thus polarized, depolarizes very slowly ; it takes 24 hours of rest to return to 1.414 volt. M. Beetz has applied this same system to the construction of Daniell elements which serve as standards. In this case he mixes for one arm of the tube, plaster of Paris with sulphate of zinc, and for the other arm the same with sulphate of copper, a copper serving as the pole for this arm. A rod of unamalgamated zinc is introduced into the sulphate of zinc end of the tube. When the paste has become perfectly firm, the ends of the tube are closed with paraffin. The electromotive force is 1.036 volt, and the internal from 13,000 to 15,000 ohms. Difference of temperature makes but slight change in the internal resistance.

This cell, when placed on closed circuit for some time polarizes but slightly, and a polarized element recovers itself in about a quarter of an hour.

As might have been expected, Beetz's cells have been modified, but whether these modifications shall prove of practical value will only be learned by a more extended experience with them.

We have the cell of M. Bagration, in which he forms the solid mass by mixing chloride of ammonium with sand, but this mixture absorbs moisture.

Dr. Onimus applies the method of Beetz to piles, using chloride of ammonium and chloride of zinc. He stiffens these exciting liquids by the addition of plaster, which in solidifying forms a dry body. In place of pure plaster, a mixture of plaster and peroxide of manganese or the sesquioxide of iron may be used as they seem to slightly increase the electromotive force, it is stated, and serve to hasten the return of the cell to its normal force after used.

These piles are not expensive, and are easily transported. After complete exhaustion they are regenerated by soaking anew in the exciting liquid. The element of Schuler is composed of concentric cylinders of amalgamated zinc and copper respectively, the zinc being inside. The space between is filled with plaster saturated with muriatic acid in which zinc has been dissolved, and to which has been added 7 per cent. of common salt.

Mr. Weston's modification of Clark's cell, which has already been described in the REVIEW, consists simply in increasing the space occupied by the sulphate of zinc, and giving to it a density of 46.5° B. at 27.6° C. It has many advantages over the original.

Mr. Van Dyck, of Rutgers College, has recently proposed the oxide of copper cell as a possible standard, but this cell does not retain its initial electromotive force, which is about 0.98 volt when giving a current, but falls to about 0.6 to 0.7 volt, where, however, it remains very constant. Of course, for use with the electrometer, this fall would be of no consequence provided the initial force proved invariable and constant.

This he seems to have established by his experiments so far.

Further information as to this cell will no doubt prove of interest.

Plainly, the *desideratum* for a standard cell, is one that during a reasonable length of time on closed circuit, loses practically none of its initial force. Again, one in which the error due to difference of temperature is inappreciable, and lastly, one which will permit of aggregation, that we may make use of any multiple of its electromotive force. Of course, there are many other attributes which would increase the usefulness of the standard cell, but these three seem to be the most important.

GENERAL WESTERN NEWS.

At Albany, N. Y., on the 14th inst., while hoisting the gasometer for the Gas Company, the gaff gave way and five men were precipitated from the platform. Three men fell a distance of 105 feet to the bottom of the well and were killed. In mentioning the accident, will the advocates of the gas interests please have the goodness to state the fact that the dynamo was not running, or the loss of life might have been far greater? The item is published as a mere act of reciprocity, which, it is hoped, the gas people will appreciate.

Peoria, Ill., is to have a Central City District Telegraph Company, for the purpose of operating local telegraph lines and conducting a messenger service—capital, $50 000. J. P. Smith, John C. Yates, W. H. Anderson, incorporators. License was issued by the Secretary of State on the 18th inst.

At Freeport, Ill., the electric lights on the court-house dome have been ordered down by the supervisors. The company refuses to remove them, and, in the words of a correspondent, "as the climbing is not good, the supervisors have made no movement to enforce the order."

The ignorance of the general public relative to arc light circuits is shown in a story going the rounds, telling how a couple of light-fingered gentry undertook to steal the cash-box at a church fair, which was lighted by arc lamps. One of these was to open the wire, and the other to pocket the boodle under the cover of the resulting darkness. When all was ready, the first party threw a wire over the circuit line while standing on the furnace register. A shock, followed by instant death, resulted, but the cash-box remained intact. The line had one ground, and the second ground through the body of the unfortunate speculator ended his ignoble career—a warning to those who incline to monkey with the buzz-saw.

There is another class of persons who monkey with the buzz-saw who should know better. These are the inventors of lightning arrestors, who seem almost never to consider the fierce and powerful antagonist they are contending against, nor do they seem to comprehend the rapidity of movement of this subtle force. Two forms of lightning arresters, or protectors, are constantly coming to the surface. The first is based on the assumption that a lightning current has plenty of time to make a magnet in its course through a spool, and put on its own ground by so doing. This assumption is based on the ability of a battery current to do all such way work, but a static charge of the kind that nature generates in an electrical storm is to a battery, or even to a dynamo current, what a racer is to a plow horse, or the "limited" to a way freight train, and the mischief is done before the current can be converted into magnetism, and this can overcome the inertia of the armature and close the line to ground, or in other forms open the wire.

The second form depends upon the heating effect of the current to melt the wire of a soft metal strip, and leave the line open at the fusible point.

Now, when a charge of heaven's electricity can readily descend through the resistance of some thousands of feet of air, which, on striking a church spire, will divide—one portion going down dry rafters inside the structure, while another follows the wet roof outside, both subsequently joining through a brick wall to reach ground, or a portion of which will leave the roof and jump twenty feet or more to a tree top, and down this to the grounds, will such a charge make a very serious matter of jumping the little space where the soft strip is melted out—a matter of, say, one or two inches? Or, in another case, will the heavy induced charge on such a wire, resulting from one of these static explosions, be likely to rest quietly because there is one of these small areas of insulation in its path? With an ordinary Holtz machine a charge may have potential enough to pierce a Leyden charge, and yet this is no more than a single crystal to a mountain of granite, compared with one of the discharges from nature's condensers.

All this has been so often told that it would seem superfluous to harp upon it; but the constant reappearance of the delusive phantoms alluded to seems to call for a repetition of the oft-told tale.

The only arrester which appears to have sound philosophy for a basis is one in which the heating of a wire releases a spring, which claps a ground on the line, and which, at the same time, permits a high-tension current to escape through a mere film of mica between line and ground, over which the thin wire is tightly drawn. If any one can better this, here is a golden opportunity; but up to this writing it stands at the head.

Underground matters in Chicago are progressing finely. The Western Electric Company is about to put Patterson cables into Dorsett conduits as follows: Along Franklin street, from Lake to Jackson; along La Salle, from the river to Jackson; along Dearborn, from Lake to Jackson; along Washington, from Dearborn to South Branch; and along Jackson, from Dearborn to Franklin.

At all the street corners, and at alleys where needed, manholes will be placed, so that every block and building can be readily reached.

The same company have closed contracts with the Chicago Telephone Company for placing about 500 miles of wire in Patterson cables laid in wooden conduits of a rectangular shape, the cable to be protected by surrounding it with one and one-half inch of hydraulic cement.

900 wires will be laid on the West side from the branch exchange at Washington and Desplaines streets, as follows:

250 from Desplaines, along Washington street to the tunnel.
150 to Lake and Desplaines streets.
100 to Lake and Green streets.
200 to Madison and Green streets.
100 to Desplaines and Monroe streets.
100 to Clinton and Harrison streets.

From the Twenty-second street branch exchange on the South side.

150 to Twenty-third street and La Salle.
150 to Sixteenth street between State and Dearborn.

The wires are to be 18 gauge, and grouped in cables of 50 and 100 conductors.

The Standard Cable Company—Waring's patents—have a contract with the telephone people to lay cables on the north side as follows:

150 conductors from the Chicago avenue exchange to State street.
250 from the same point to Wells street.
150 from the same point to La Salle Tunnel.

The wires on all the routes, or nearly all, on leaving the conduits will be connected at poles to the already existing aerial cables of the company, in the center of the city.

An ingenious arrangement is to be added to the cables bedded in cement, for the purpose of hunting up faults which may occur through accidental injuries to the metallic covering. The innate malignant cussedness and devilish stupidity of the average laborer is capable of paralyzing the best efforts of scientific engineering, and no theory has ever been able to foresee or frustrate his infernal machinations. All that can be done is to seek a remedy for mischief done. As an aid to discovering faults of this nature, fine wires are placed in the cable, leading from the office, the farther end being open, but insulated from the conducting wires. In a section of cable of 1,000 feet for instance, there would be ten of these testing wires, the first 100 feet in length, the second 200, and so on. Any leak in the cable at a point, say 650 feet from the office would be found on the 700 foot wire, so that any leak may be located within 100 feet, and thus save the necessity of unearthing the whole work. Some curious cases of grounded wires are told by a Chicago electrician, which have interest, as showing how difficult it is sometimes to locate and remove one of these persistent enemies of electrical work.

In one of the instances a serious annoyance had for several days interfered with the well-being of an arc light circuit, for which the employes of the company had searched in vain. Finally the services of an expert were put in requisition, and the trouble found in a cellar, where an industrious spider had built his summer residence at the terminal of a piece of underground work, and bridged across from the metallic covering of the cable to the wire. This in time had accumulated dust and moisture, and formed a very short and quite respectable ground, which was daily growing worse, but in removal of which cleared up the line. The leak was not sufficient to do any material damage in itself, but whenever the operatives of the plant made a second imperfect ground through their persons, current enough was diverted to produce a very unpleasant result, and as the force of these currents was daily increasing, they took time by the forelock, and the leak was stopped before it had reached dangerous proportions.

Some years ago a tree toad, with lofty aspiration, climbed a telegraph pole, and having reached the summit, thought to place himself at ease by grasping two wires while he surveyed the prairie landscape. One of these was a quad wire, the other a safety ground, or lightning arrester. His sticky feet made a sufficiently fair ground connection, and he was stark, stiff, and pretty well dried before the linemen, who sought the trouble long and earnestly, had found him.

Not long since an arc circuit was placed in an exposition building, the work of the wire men being concluded before the painters and kalsominers did their work. When the circuit was tested before starting up the instrument indicated a general lack of insulation through the greater portion of its length. Investigation showed that the wire, as well as the porcelain knobs had been well covered by the decorators, with a cheap mineral paint, mixed with flour and water, and as the building was damp from the steam used in the machinery department, the whole insulation was materially affected. Loosening up the insulators broke the ground connections, and left the line in good condition.

Painters, kalsominers, plumbers, carpenters and gas men are the bane of electrical enterprises of whatever nature, and they usually make their presence known, or at least leave their mark, where opportunity offers, in the way of partial or complete grounds. The rule with all, or nearly all these classes of mechanics is, if it is in your way, pull it down; let them put it back if they want to;" and so down comes a wire for which they can see no use, off goes an insulator, if it is an obstruction. Unfortunately they work when an electric plant is idle, or sad experience might now and then read them a severe lesson.

The report of the Boston inspector of buildings in "causes of fires," for the past year, enumerates 10 as originating from gas, 23 from kerosene lamp explosions, one from a coal oil stove explosion, 6 from upsetting kerosene lamps, and *one* from an electric light wire in contact with wood.

Col. Clowry, M. C. Bristol and C. H. Summers, of the Western Union are in California, on telegraph inspection duty.

The Edison Company have commenced the wiring of our City Hall. While beset by all the difficulties to be met with in a fireproof structure, they are making a very complete and perfect piece of work. As the County Building, joined the City Hall, and the United States Company is to wire the former, no pains will be spared by either to excel the other, and both will undoubtedly be bouquet jobs.

On the 16th instant the remains of Louis H. Brennan, construction foreman of the Chicago Telephone Company, who died after a short illness, of typhoid fever, were buried from the church of the Holy Name, in this city. The procession was large and imposing, headed by a band, followed by Court America Independent Order of Foresters, of which deceased was a member, and representatives from fifteen other courts of the order. Nearly 100 of his associates in the telephone company witnessed the obsequies, and twelve of these paid their last respects as bearers. The floral tributes were expensive and numerous, as well as beautiful and appropriate, and testified markedly to the high estimation in which he was held by the living. Some of the pieces were "Gates Ajar," cross and pillow with a telephone in the center, and the words "Good-by Comrade," from the construction department. Court America, "3" and "13" offices - branch exchange and messenger department—also contributed beautiful emblems. J. W. Brennan, Superintendent of Construction, a brother of the deceased, presented a beautiful and artistic representation of a broken telegraph pole. Employes of the Western Union, the City Fire Alarm, and other representatives of various electrical enterprises joined with the officers and employes of the telephone company, paying their last tributes to the remains of a much loved and worthy associate and friend.

Chicago, July 30, 1885.

The business of Mr. George A. Mayo manufacturer of and dealer in electric light apparatus and supplies, has been transferred to the Mayo Electrical Manufacturing Company, with office and manufactory at 100 Portland street, Boston. The organization is as follows: Edmond Reardon, President Henry F. Woods, Treasurer; F. R. Cornee, Secretary and George A. Mayo, Electrician and General Manager. Mr. Mayo has had a long experience in the electrical field, being for some years connected with the Brush and Thomson-Houston companies, and is the inventor and owner of several valuable machines and improvements. This company will make a specialty of the manufacture and introduction of small plants for lighting private residences by incandescent lamps, the power being derived from a water motor attached to the city service pipe.

The American Bell Telephone Company has appealed from the settlement made against it by the State of Pennsylvania, for the year ending Dec. 31, 1884. The State claims from the company as tax on its capital stock, $4,337.53 which is reached by taking the telephones of the company in Pennsylvania, capitalized by the Auditor General at $722,923. The whole amount of the capital stock of the company is reported at $9,602,100.

In its appeal the Bell Telephone Company gives several reasons for largely reducing the claim of the State. The company has also filed an appeal from the settlement, fixing its gross receipts involving $65,552. The City of Chester has appealed from the settlement taxing it $1,690.80 on loans.

Monday, of this week, July 27, was the nineteenth anniversary of the completion of the Atlantic cable. In all that time there has not been a moment that the two continents were not in instantaneous communication, some of the cables being always in working order. There is in this fact that which silences phophecies on the future of electricity, for no man knows what a day may bring forth We pause a moment to speak of this anniversary, and it departs from our thoughts as we pass on to more modern things yet how few were they who, twenty years ago, believed the Atlantic cable a possibility — that "Puck's girdle around the world," making it one large "whispering gallery," would ever be realized!

The Mayo Electrical Manufacturing Company of Boston, are wiring the city of Taunton, Mass., for a 600-light Brush-Swan incandescent plant to be run from a central station. A part of the plant will be put into operation about the 25th inst. They will use the Jarvis setting for boilers, and a Buckeye engine.

Telephonic News

*** It is announced that Santos and Sao Paulo, Brazil, are to be united by telephone.

*** Three fifths of all the underground wires in the country are in the city of Washington, D. C., amounting to 1300 miles.

*** The Emory Grove Camp Ground in Baltimore County, Md., is to be connected with the world by telephone to Westminister exchange.

*** Property representing, on paper, $1,000,000, was sold at auction in New York the other day for $100 cash. It was the assets of the United States Telephone Manufacturing Co., it is stated.

*** The Dolbear Telephone Company have appealed to the United States Supreme Court to have the injunction, served on them by the Bell Company, removed. This has been in nearly two years, and will probably reach trial in about one year.

*** We are indebted to W. B. Sale for a copy of the "Telephone Directory of Northern Texas." It contains a complete list of names of subscribers in some fifty cities and towns, all connected by telephone. Dallas and Fort Worth are the leading cities named in the directory.

*** The Liverpool *Mercury* states that when the telephone was taken to England by the agent of Dr. Bell, the inventor, all the patent rights connected with it were offered to the Post-Office Department for £30,000. The offer was declined, but a little later these sapient officials, who thought £30,000 was too much for the patent for the whole United Kingdom, offered £540,000 for the exchange established in London alone. And they asked in vain.

*** A bill was filed last week in the Circuit Court of Baltimore in behalf of the creditors, asking for the appointment of a receiver to take charge of the affairs of the Washington Telephone Company of Maryland. The Court (Judge Phelps) appointed William T. Biedler, of Witz, Biedler & Co., as receiver. The general object of this bill is to protect the subscribers of the company, pending the litigation between it and the American Bell Telephone Company.

*** The Electrical Subway Commissioners of Brooklyn, appointed to enforce the Underground Wire law so far as practicable, have not fixed a date for another meeting, but will be ready to receive plans for their action on August 12 from the telegraph and telephone companies. These latter will be expected to furnish with their plans maps showing the location of each instrument in use by subscribers. Secretary John Reynolds, of the Board of Commissioners, said to-day that already several communications had been received relative to a hundred or more patent methods for underground wires, all of which had been submitted to Messrs. Plympton and Raymond, the scientific members of the commission.

*** The National Telephone Exchange Association will hold its annual meeting Tuesday, September 8th at 10.30 A. M., at the Narragansett House, Providence, R. I. The proceedings will embrace "The Report of the Committee on a Standard Wire Gauge," and a number of papers on leading telephone matters by members of the Association, among which are the following:

"Legislation," by H. L. Storke; "Exchange Statistics," by B. E. Sunny; "Some Practical Results of Long Distance Telephoning," A. S. Hibbard; "Observations on the Use of Cables in Cities," by C. N. Fay; "On the Law Multiple Switchboard," by Dr. S. M. Plush; "The Underground Problem," by The Western Electric Company; "Theory and Practice of the Construction of Telephone Cables," by Dr. W. W. Jaques; "Telephones, Transmitters and Magneto Bells," by E. T. Gilliland.

*** John Kee, nicknamed "Telephone Jack," died at South Norwalk, Conn., Saturday morning, from sunstroke. He had been in the employ of the Western Union Telegraph Company off and on for twenty years. It is said that his family are well off.

*** As an indication of the amount of business done at the Erie (Pa.) Exchange, there were 2,184 calls in one day recently, besides about 100 calls for out-of-town connections. The very natural feature of the out side business is that calls to the Erie Exchange from surrounding towns average about three to one of calls from this exchange to neighboring places. The Erie Exchange system was never in such good shape as now—a fact which is directly due to the efficient management of Major Francis.

*** Before the wholesale promise of removal of the wires off the roof of the Treasury Building, at Washington, was entered upon, each company was requested to go upon the roof and tag such of their wires as were in the use of the Government. This was an excellent chance for the corporations to keep their respective lines intact, and the instruction was obeyed to the letter and probably a little beyond. Whether all of the wires are in the service of the United States, or that the companies were desirous of having them remain in the positions they occupied, is unknown except to the companies themselves; but it is known that when the men had finished the tagging the number remaining without mark was very small, and when the time arrived to cut loose the outside wires there were only a few wires to sever. A glance at the bridge on the top of the Treasury Building will furnish evidence sufficient that nearly all the wires remain in place, and, if all of them are in the service of the Government, its telephonic and telegraphic communication is both large and extensive.

*** British Telephone experiments of an important character were made recently by officials of the Post-office, and the question as to whether oral communication between the great centers of commerce in the country is possible was placed beyond doubt, the result of the experiments being eminently satisfactory. The trial was made between Uxbridge, fifteen miles west of London, and Liverpool, and the experimentalists were Mr. Woods, of Oxford, and Mr. F. E. Evans, of Birmingham, Superintendent Engineer, the latter having charge of the Liverpool station. The Gower-Bell telephone was used for the purpose, and connection was made with a new line of telegraph. The distance between Liverpool and Uxbridge is 200 miles, and experts were doubtful about the result of the experiments, this being the longest distance ever tried in England for telephonic communication. The test applied, however, satisfied the operators that it is possible to communicate between centers twice that distance apart. A double wire was used in this instance, and conversation was distinctly audible; and Mr Woods, the operator at Uxbridge, acknowledged that though he had been very sanguine of success, his expectations had been more than fully realized.

*** Detective Droste, of Baltimore, says he has received from a convict in the penitentiary, who has five or six years to serve, a letter detailing a plan which the prisoner has worked out for defrauding banks by the forged-check game. As it would be some time before he could put it into effect, he gives Droste a sketch of the way he would do it if he were to get the chance. He makes the telephone a dangerous ally in the business. The plan is about as follows: One of the gang buys a bill of goods from a mercantile house, and gets one of their genuine checks in making the change. The gang then secures a blank check such as the mercantile house uses, and it is filled up for the amount wanted and signed, and the forgery is complete. The man who bought the bill of goods has in the meantime scraped up an acquaintance with some other business house. At the time when his confederate starts for the bank to get the forged check cashed, he calls at the house where he has obtained the genuine check, and whose name has been used in the forged one. Having already been a buyer there, he is pretty sure of a courteous reception. He asks permission to use their telephone, and he calls up the other house with which he has scraped an acquaintance. While he is talking about business through the telephone, his confederate reaches the bank and presents the forged check. The teller does not know him, and asks for identification. The confederate says he is in a hurry to get the money, and proposes to the teller to call up the house through the telephone. By this time the member of the gang at the other end of the telephone shuts off the connection with his scraped-up acquaintance, and receives the telephone inquiry of the teller as to the check then on the bank counter for payment. He, of course, notifies the teller that the check is all right, and is to be paid to the party who presented it. Then he leaves the telephone, bids the merchants "good day," and the teller has probably paid the forged check. The plan of the bank is that half-a-dozen banks in a city would be beaten at the same time. Detective Droste thinks the scheme a dangerously shrewd one, and says he has not heard of it before.

A Young Lady Telephoness Jilts Her Unseen Lover After Accepting Him.

A romance of the telephone, showing how a young lady operator trifled with and finally jilted a susceptible youth who passionately wooed her over the wires, has just transpired The principals in the affair are a young man, an operator in Litchfield County, and a young lady operator in New Haven, Conn.

As early as last winter the romance began, and when the operators were not busy the young man acquired the habit of asking the New Haven operator about the weather, local news and other gossip, giving in return any thing that he thought would interest the young woman, whom, by the way, he had never seen, and presumably knew nothing about. He gave the name of "Claude Melnotte," while she signed herself "Agate Holbrook," and the Litchfield youth entered at once upon the "delightful occupation of telephone mashing." Finally, the young man from the country began to ask after the color of the New Haven operator's hair and eyes, figure, weight, etc. She in turn professed curiosity as to the size, color, etc., of his moustache, and quite an interesting correspondence by wire had begun.

At length young Melnotte became so infatuated that he one day told the young lady that he loved her deeply, and wanted her to become his wife. He said: "I am not on my knees, but would be if I were with you. Please don't scream or blush, but give me the answer that will make me the happiest of men—yes." The New Haven operator had a hearty laugh, and finally, in a spirit of fun, answered that she accepted and that he must ask her mother.

Then the young man, day after day, burdened the wires with the most ardent messages of love and affection to the extent that the New Haven operator got sick of the affair, and substituted another girl in her place. But he saw through the deception and wouldn't have it. He said by wire that he was coming to New Haven to claim his promised bride, and sure enough he did appear at the office, asking for Agate Holbrook

Among all the good-looking lady operators there was none, however, that would answer to the name. He haunted the place for a week, and endeavored to find out who the young lady was who had attracted him to the City of Elms, but in vain. He has resigned his place in Litchfield County, and report says that he has taken to drinking.

A Revolver vs. Telephone Wires.

About six weeks ago General Manager Uline, of the Hudson River Telephone Company, applied to the Common Council of Kingston for leave to stretch telephone wires from Rondout to that city—a distance of about three miles. The State had authorized the company to proceed, but the object was to also get the privilege from the municipality. The permission was granted by a vote of 13 to 4, and Mr. Uline at once commenced the work. Recently, when he arrived in Albany from Round Lake, Mr. Uline found a telephone message of a rather alarming nature from Mr. C. L Quackenbush, the director of the operations of the eight Albany linemen who were engaged in the work.

The substance of the message was that the linemen dared not proceed in their work. When they endeavored to stretch wires on a pole on Union avenue, Rondout, they encountered a virago with a revolver. The woman's name is Cæcelia O'Reilley. She is a widow, and owns the premises abutting on the street on which the linemen were working. Whenever one of the men sought to climb the pole, Mrs. O'Reilley presented the revolver, or threatened to kill him if he persisted. A truce was declared and the message sent to Albany. Mr. Uline left Albany for Rondout on the 10.20 train. When he reached the scene of the suspended operations, Mrs. O'Reilley still stood menacing the men with the revolver. She had stood her ground for hours, and her eye shot fire. Manager Uline endeavored to reason with her, but in answer to all he said she demanded money for the privilege of climbing the pole, significantly slapped the revolver, and shook her head in a way to indicate that she would kill any lineman who persisted in ascending the stick. The loyal men were ready to do or die, if commanded to proceed by their manager.

Mr. Uline seeing that "taffy" was unavailing, and knowing that he had acquired a right to the street, went before Recorder Hussey and demanded the woman's arrest, stating that she had threatened him and his men with a revolver. The recorder refused to issue a warrant. Then Mr. Uline went before Mr. Justice Westbrook, who, when the facts had been explained, issued an injunction against the woman, restraining her from interference, and placed it in the hands of Sheriff Wurts, who soon had Mrs. O'Reilley in custody The linemen then continued their work. Mr. Uline will present the recorder's neglect of duty, in refusing to issue a want, before the Governor. The disputed property is safely passed, and all trouble is over. Still, when General Manager Uline faced that ugly revolver in the hands of determined Mrs. O'Reilley, he wasn't exactly sure whether the telephone pole or himself would be buried first. It was a delicate point to handle, but Mr. Uline was equal to it.

Extravagant Claims of the Pan-Electric.

The following bill has been filed at Memphis, Tenn., by the Pan-Electric Company against the American Bell Telephone Company:

First—The bill charges the Pan-Electric Telephone Company owns letters patent for novel and useful improvements in telephoning—bringing the art to the highest state of perfection.

Second—The Bell patent and the Pan-Electric interfere, and the Bell is void or invalid *in toto*, or to the extent of such interference.

Third—The Pell has slandered and misrepresented the patents and inventions of its opponents, exaggerated and falsified its successors by litigation or by publications, letters, secret circulars and verbal threats and menaces, and has kept its opponents from introducing the improved telephone, and thereby greatly damaged its opponents, whilst, at the same time, depriving the public of a better and cheaper telephone system.

Fourth—That the Bell telephone patent of March 7, 1876, is not useful; no telephones used which are constructed in accordance with that patent. The Bell does not use in its telephone since its original patent, but uses the discoveries of others. No practical and useful instrument was ever in use constructed after the Bell patent. The patent is only used to litigate with. The ideas of others form and fashion the practical, commercial telephone.

Fifth—Bell was not the first and original inventor of the art. It was known to Philip Reis, of Germany, who died in 1874, leaving a description, figures and models covering the art, and showing that Reis had fully conceived it, and whatever has since been done is an

improvement on the art as Reis conceived it, and that Reis' invention was published in Europe and America long before Bell's patents.

Sixth—That with the materials used by Reis, and none other, and pursuing exactly his ideas as left in his description, figures, and models of the art, a telephone possessing capacity to transmit and deliver articulate speech can be constructed, that is, a speaking telephone, and when constructed, it will be equal if not superior to a telephone constructed after the manner of the Bell patent of March 7, 1876.

Seventh—That the test is the speaking faculty, and Reis' conception of the art, with the materials he used, without change or addition or improvement in any particular whatever, possess the speaking faculty.

Eighth—That the litigation on the subject has been of four classes: 1. Collusion suits; 2. Suits in which there were no contests or opposition; 3. Suits in which it was conceded that Bell or his opponent in the suit was the inventor, and in which the inquiry was, Which of these was the first? 4. Suits in which the validity of the Bell patent was conceded, and the question was simply an infringement.

Ninth—One case has been decided in which the broad question was made whether Bell was the first inventor or not, in which it was decided that he was, but the conclusion was reached by finding as a matter of fact that the Reis conception of the art was incapable of talking without improvement. This fundamental and decisive fact is just the other way, as complainant will demonstrate by actual tests, under conditions that will leave no room to question the fairness of the tests, and which complainants are ready to prove by instruments already constructed.

Tenth—That Bell knows the danger of the test, and has so managed in the past litigation as to evade it, except in one case, and in that the truth was suppressed and the judge was led into a misconception of it.

Eleventh—The bill sets out all the cases in which Bell has attempted to sustain his patent, and shows fully that these cases do not settle the questions at issue and are not in the way of the Pan-Electric in this litigation as to its improvement, and that complainant's telephone is superior to all others as a commercial instrument.

.... Judge Donohue, of the Supreme Court of this State, denied the motions to set aside the decree of foreclosure in the suit of the Farmers' Loan and Trust Company for the foreclosure of the $10,000,000 mortgage upon the property of the Bankers and Merchants' Telegraph Company, in which a degree was entered authorizing the sale of the property, and for the removal of the Trust Company from its position as trustee of the mortgage. The decree in the foreclosure suit was entered upon consent of all parties to it. Judge Donohue says that there are many defects in the decree, and the specific property sought to be covered by it, he says, can nowhere be found in the decree. Therefore, when the referee comes to sell the property, it will be somewhat difficult to tell what he sells and where he gets the power to sell any definite property. But the Court agrees with the Trust Company that the applicant who represents $250,000 of bonds has no right at this time to intervene as a party to the suit, and for that reason the motion must be denied. He disagrees, however, upon the point that the objections are matters addressing themselves to the purchaser. He says: "In my judgment this goes to the title of the property, and all dealings with it take with it full notice of the defects, and it seems to me, buy with it, as one of the counsel for the bondholders remarked 'a crop of law-suits'; but on this application of the moving party I cannot interfere. On the motion of removal I do not consider the merits at all, as a large mass of the bondholders now appearing are satisfied with the trustee. The Court fully agrees with the plaintiff on the propriety of an early sale, and pointed out the necessity long since of such a course, but I do not agree with them on either of the necessity or propriety of what may be selling what may prove a defective title."

.... China, which only six years ago had but six miles of telegraph lines, has now completed a system by which Canton, the capital of southern China, is brought into direct communication with the metropolis of the north. News from the principal cities can now reach London within four hours.

... It is stated in Montreal, on what is considered reliable authority that the Canadian Pacific Railway will very soon open its immense telegraph system to the public. The Western Union and its attachment in Canada, the Great Northwestern, have for some time been most diligent in their attempts to secure this company's wires; but their efforts have been ineffectual. A cable from British Columbia to Australia is spoken of, and Government aid has already been asked for by a firm of London capitalists who are interested in the venture. At the recent session of the Dominion Legislature a large vote, amounting to nearly one million dollars, was included in the additional subsidy to Canada's transcontinental railway for the purpose of perfecting its telegraph system which is now said to be in a position to compete with other corporations. The Western Union at present has a most complete monopoly of the telegraph business of the Dominion. It first secured the Montreal Telegraph Company, and then the Dominion Company which corporations it now runs under the name of the Great Northwestern Company, and guarantees the shareholders 8 per cent. per annum. When the Mutual Union Company was organized a branch in Canada was started under the name of the Canada Mutual. This of course befel the same fate as the parent oranization across the border. While the Canadian Pacific scheme has cost the country an enormous sum in its construction it has relieved the people of many monopolistic thraldoms, and the millions sunk in the enterprise may yet bear fruit.

.... The telegraphic profession will, we predict, in the course of a few years, be composed of female members entirely. In every large office in the United States the proportion of male and female employees is undergoing a slow but positive change. Ten years ago the ratio was about 30 males to 1 female operator; five years ago the ratio was reduced to about 15 males to 1 female, while to-day it is less than 6 to 1. At this same rate of growth, in the future, but ten years will be required to balance the scales. Fifteen years from to-day will find the female members in the majority, and twenty years hence it will be difficult for male operators to procure work at the key at any price. The days of male operators are numbered. The talk that lady operators are physically unequal to the task of working heavy circuits, incompetent to receive press, etc., etc., is mere bosh. They can be, and are rapidly being, educated to meet the requirements of the profession. They are reliable, which at once gives them an advantage over the male members. The Western Union's heaviest circuits in the main office for years have been handled by women. Gradually the handful of women confined to a few city wires in a remote corner of the great operating room has grown to an army, spreading its usefulness to every section and department of the company. Five years ago ninety women were employed at 195, to-day there are over 275. In the city of New York, the Western Union force, five years ago, consisted of about 650 men and 100 women; to-day, notwithstanding the natural increase of business, it stands about 500 men and 350 women. While the force has been increased to the extent of 100 operators, the male portion thereof has decreased to the extent of about 150. These figures also apply to other sections to a greater or less degree. For instance, the heavy New York circuits in Albany are now in the hands of women, who receive $30 and $40 a month less than the men, whose places they so recently filled. Of course, the saving to the Western Union Company is sufficient recompense for any inconvenience to which they may be subjected, while they persistently dwell upon the reliability of the women as compared with the men, as a reason for making the changes.—*Telegraphers' Advocate.*

.... The construction of the State telegraph line through Piauhy, Maranhao and Para is reported to be progressing as rapidly as the natural difficulties of the route will permit. Work will be begun on the line between Para and Vizeu, province of Para, during the present month. It is expected to connect with the projected American cable at Vizeu.—*Rio News.*

.... The Direct Cable Company reports that its receipts for the first half of this year were £32,467 less than for the first half of 1884. The company gets 18⅝ per cent. in the pool, and the Western Union Telegraph Company, as lessee of the American cables, 22 per cent., so that the loss of the Western Union must be a trifle more than that of the Direct Cable Company.

.... The National Printing Telegraph Company, whose objects are to manufacture, operate and lease telegraph instruments, and to build, operate and lease telegraph lines, has filed articles of incorporation. The capital is $1,000,000. John Rooney, Abner McKinley, Mark W. Samuel, Samuel V. Essick, George H. Fearen, Louis J. Morrison and Wm. M. Denman are the incorporators.

.... At the annual meeting of the stockholders of the Vermont and Boston Telegraph Company, at White River Junction, Vt., the following directors were chosen: Norvin Green, Thomas T. Eckert, Charles A. Tinker, and Roswell H. Rochester, of New York; Thomas Roche and Henry C. Sherman, of Boston; George W. Gates and George W. Smith, of White River Junction; Robert J. Kimball, West Randolph, Vt. The directors subsequently elected Norvin Green president; Thomas T. Eckert and Charles A. Tinker, executive committee; R. H. Rochester, secretary and treasurer.

.... The London *Daily News* says: "It is a fact worth recording that the message sent by Mr. Cyrus Field to the President of the United States, on Saturday evening, occupied longer in its transmission from the Buckingham Palace Hotel to Throgmorton street than it did in its transmission from the latter station to Washington. The time taken in sending the message to Throgmorton-street was ten minutes, while the journey through the Atlantic cable and on to Washington was performed in eight minutes It reflects credit upon the Western Union Telegraph Company that they facilitated the transmission of the messages by connecting their Cape Breton station direct with the Executive Mansion at Washington.

.... In Hartford, Conn, the parties to the telegraph contest announced that a compromise was possible, and one whole afternoon was exhausted in arranging it. The final agreement is as follows: The Bankers and Merchants' will surrender to the Western Union the use of four wires between Cleveland and Chicago, and the Western Union will give up six wires between the same points. The Western Union also abandons the wires west of Pittsburgh. The Bankers and Merchants' gives to the Western Union the use of two additional wires between New York and Boston. As to the underground wires in Chicago which have entered into the controversy, the matter is to be left to Judge Blodgett, of that city to determine as to the practicability of giving the use of four wires to the American Rapid.

.... The case of J. H. Goodsell against the Western Union Telegraph Company has been on trial since June, 1884, before ex-Judge James C. Spencer, of this city, as referee. The action was brought in the Superior Court to recover moneys claimed to be due to plaintiff, and for damages for the breaches of a contract to transmit the news reports, formerly known as the National Associated Press dispatches, at specified rates for ten years. The referee has filed his report in favor of plaintiff. He finds the defendant indebted to plaintiff for money received $16,777.42, with interest from July 1, 1882; and that defendant committed various breaches of the contract, and finally a total breach, and that plaintiff is entitled to recover as his damages for such breaches the sum of $220,306. Miller & Savage, of 202 Broadway, were attorneys for plaintiffs.

TELEGRAPHIC

.... Samuel F. B. Morse, the father of telegraphy, was once a painter in New York, and painted portraits for $5 apiece.

.. .. The traffic receipts of the Brazilian Submarine Telegraph Company for the week ended 3d inst. amounted to £2,670.

.... The Postal Telegraph Company has opened for business in Boston, in the office of the Commercial Cable Company, No. 4 Arch street.

.... The Commercial Cable Company has leased two more private wires between Boston and New York to bankers and will string three more within 30 days.

.... The estimated traffic receipts of the Direct Spanish Telegraph Company for the month of June, 1885, were £1 333, against £1,336 in the corresponding period of last year.

.... It is stated that the Dominion Government intend to at once construct a telegraph line connecting Edmonton and Calgary, two important centers of industry in the northwest territories of Canada.

.... The telegraph line from Moulmein to Myawaddy, on the Siamese frontier, a distance of 75 miles, joining the Siamese line from Bangkok, will, it is believed, be finished before the coming dry season.

.... It is stated that six thousand miles of telegraph wires belonging to the Bankers and Merchants' Company are strung upon poles of the American Rapid Company between Boston and Cleveland, O.

.... The head of the International Telegraph Bureau at Berne, M. Churchod, has arrived in Berlin in order to concert with the German Postmaster-General, Dr. Stephan, the final arrangements for a Universal Telegraphic Congress.

.... Mr Cyrus W. Field will give a dinner on the 5th of August to celebrate the laying of the first Atlantic cable. Mr. Phelps, the American minister, and a number of gentlemen prominent in the telegraphic world will be among the guests.

.... The Western Union Telegraph Company, the Commercial and French cable companies and Messrs. Siemens Brothers, have united in a petition to the House of Lords against the passage of the submarine cables bill which has passed the House of Commons and is now pending in the Upper House

.... The number of despatches transmitted by the Great Northern Telegraph Company, of England, in the first two months of this year was 168,799, as compared with 170,-021 in the corresponding period of 1884. The revenue collected by the company in the first two months of this year was £41,200, as compared with £38,680 in the corresponding period of 1884

.... Lord John Manners, England's Postmaster-General, in addition to his proposal to reduce the present telegraph tariff from twenty-four to nineteen cents for ten-word messages, the addresses to be free, proposes to encourage the sending of smaller messages by charging but twelve cents for messages containing but three words, and a cent for each additional word.

.... The Legislative Department of India have circulated, for the expression of public opinion, the draft of a bill giving newspapers twenty-four hours' copyright in all news and telegrams obtained at their own cost. The bill was generally approved by the Anglo-Indian newspapers, the only objection being that in a distant country like India the period fixed was not long enough. The native press, on the other hand, which is too poor to afford special telegrams, raised an outcry against the proposal, as calculated to deprive it of the chief source of its information, namely, the telegrams published by its wealthier contemporaries.

ELECTRICAL AND SCIENTIFIC

* * Copper thread is woven into certain styles of laces. Whoever wears them should be provided with the latest style of lightning arrester, unless she is struggling to lead in the record of sparks drawn to her.

* * It is announced that an English inventor has lately devised a method of coating tin with a material resembling glass, which removes all danger of poison in canned goods, and the adoption of his process is likely soon to become general.

* * Of at least a dozen fishes having electric organs, the electric eel of South America is the most powerful. It reaches a length of six feet, and is provided with a pair of batteries, containing some hundred minute nerve-supplied cells, which exhibit the same phenomena as artificial batteries.

* * The Providence Railroad Company, after a trial of the Judkins railway train signal on one of its trains for more than two months, has ordered the same equipment on other trains at once. This is an electrical arrangement which takes the place of the bell rope running through the train.

* * A recent discovery of mica, at Tallulah, Ga., is reckoned the richest in the world. It is said that blocks a foot square can be taken out, and that the supply is declared inexhaustible. There is such a demand for the mineral in stove making that it has been growing scarce and dear for several years.

* * Barometric changes are determined in South Chili by the use of a curious instrument. It consists of the cast-off shell of the crab, which is said to be extremely sensitive to heat and moisture. It will remain quite white in clear, dry weather, but will indicate the approach of moist atmosphere by the appearance of small red spots, which grow in number and size as the moisture increases; and on the appearance of rain the shell becomes entirely red and remains so while the moisture continues.

* * A German patent, taken out by W. Braun, of Hamburg, proposes to refine impure copper by passing gaseous hydrochloric acid through it in the molten state, with as little access of air as possible. It is said that the cuprous oxide contained in the copper is volatilized as chloride. Also all other impurities which may be present as oxides, or as metals which decompose vapor of hydrochloric acid at high temperature, are removed by this treatment. The result is stated to be a copper of very great purity and toughness, free from bubbles, and of high conductivity.

* * The Henry Electric Railway Company, of Kansas City, Mo., is to be organized with a capital stock of $500,000. At a recent meeting, a committee, consisting of Colonel Theo. Case, Warren Watson and H. J. Van Dorsten, were selected to prepare the necessary articles of incorporation The gentlemen present declared themselves perfectly satisfied with the progress thus far made, and preparations are being made to build a car specially designed to facilitate the process of electrical experiments. It was the opinion of all present that success in the near future was an assured fact.

* * According to M. Gaiffe, a microscopic examination of fine platinum wire shows that the latter breaks in drawing at points where no sign of injury existed before going through the drawplate. After drawing, however, spots appear on the metal, and M. Gaiffe infers that these are due to particles of dust which adhere to the metal as it is drawn, and scratch it. By carefully excluding dust particles, he has succeeded in drawing wires $\frac{1}{1170}$ inch in diameter with ease, and he considers that with finer plates much finer wires can be produced. In a recent note we mentioned that Professor S. P. Langley had obtained wires $\frac{1}{18000}$ inch in diameter.

* * The signs "+" and "—," it is said, were first used by Christopher Rudolph, about 1524. The sign "=" was first employed by Bobert Recorde, in 1557, because, said he, "noe 2 thynges can be moare equalle."

* * Col. Snowden, superintendent of the Philadelphia Mint, has perfected an invention which, it is said, will render it impossible to counterfeit United States coinage This invention consists of a twice bisected steel collar, which, when attached to the dies, will form raised letters upon the peripheries of the coins. The new coin cannot be imitated by counterfeiters, because it cannot be made in a mould or by any process except the steel collar, hand engraving or a screw press. Milled coins can be lifted out of a mould without injury, because the lines upon their edges are straight up and down. The new ones have letters and stars on their edges, and cannot be taken out except by injuring them and multilating the moulds.

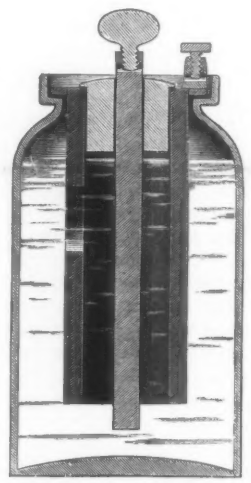
* * The following are some of the particulars of the Bartholdi statue of Liberty which recently arrived in New York: It measures 46.08 meters from the base to the top of the torch, 35.50 meters from below the plinth to the crown, 34 meters from the heel to the top of the head. The forefinger is 2.45 meters in length, and the head is 4 40 meters in height. The nose is 1.12 meters in length. About forty persons were accommodated in the head at the Paris Exhibition in 1878. It is possible to ascend into the torch above the hand. It will easily hold twelve persons. The total weight is about 200,000 kilos., of which 80,000 are copper and 120,000 iron. The statue represents an outlay of more than 1,000,000 francs.

* * A simple method of perforating glass has been devised by M. Fages. The apparatus employed consists of a rectangular plate of ebonite, about 18 by 12 centimeters in size, for an induction coil giving a spark of 12 centimeters. A brass wire passes under the plate, and has its point bent up and just penetrating the plate, but no more. This wire is connected with one of the poles of the coil, and is pointed at the end. A few drops of olive oil are placed on the plate round the point, and the glass plate to be perforated is laid upon it, care being taken to avoid the inclosure of air bubbles The olive oil serves to insulate the wire; and another wire, connected to the other pole of the coil, is brought down over the glass above the lower point. The spark passes between the points and perforates the glass. By moving the glass laterally, a series of holes can in this way be pierced in a few seconds.

* * An interesting legal point is soon to be tested by the New Orleans City Council, and if it be successful in the issue it proposes to invite there will be a great saving to the city in the cost of its street lighting. The Jefferson City Gas-Light Company obtained from the Legislature a charter giving the company the exclusive privilege of lighting the Sixth and Seventh Districts for a term of fifty years, and to charge the city at the rate of $50 per annum for each lamp. But lately this sum was reduced to $36 per lamp, upon condition that the monthly bills of the Gas Company should be paid promptly in cash by the city. This contract, if a contract it is, has thirteen years longer to run Since the city now pays only $18 per lamp for its gas light, there is no reason why it should pay $36 to the Jefferson City Gas Company. The electric light as a public illuminator was not known or in vogue when the Jefferson City Gas Company was organized and chartered. Its charter, then, could not prohibit the use of electric lights as being in conflict with the monopoly rights of the Jefferson City Company. The Council, in order to test this question, proposes to advertise for bids to light the Sixth and Seventh Districts with electric instead of gas lights. The contract will be much cheaper, and, if accepted, the present gas lights will be cut off from the streets, and will be no longer used or paid for by the city. Will the Jefferson City Gas-Light Company enjoin the city from such proceedings, under the exclusive privilege which they claim of lighting the streets of the Sixth and Seventh Districts?

* * The thirty-fourth annual meeting of the American Association for the Advancement of Science will be held at Ann Arbor, Michigan, from August 26 to September 1 Bar Harbor, Maine, was the locality originally chosen, but, as suitable accommodations could not be secured, it was changed by invitation to the University of Michigan. The absence of the students during the summer leaves their quarters available, and no difficulty will be experienced in obtaining ample accommodation. Reduced fares have been obtained, and a special through train will be run from Buffalo on the 25th, allowing two hours at Niagara. A complimentary excursion to the Saginaw Valley will be given during the session. The retiring president, Professor J. P. Lesley, of Philadelphia, will deliver his address on the evening of the 26th. The president-elect is Professor H. A. Newton, of New Haven; permanent secretary, F. W. Putnam, Salem, Mass.

* * In a recent communication to the French Academy of Sciences, M. Hospitalier points out that in general the apparatus used for the industrial measurement of electricity only give concordant results with continuous currents, like those of the battery or accumulator. When the current is "undulatory," for example, like that of the dynamo of M. Anatole Gerard, which passes through zero four times each turn, but preserving the same sign, the indications furnished by amperemeters and voltmeters are always below those corresponding to the true value of the energy of the external circuit. M. Hospitalier has determined the departures from the true values given by several meters of the kind, with the current of one of these machines. He finds, for instance, that when electric lamps in the external circuit are brought to the same luminous intensity, the indications of an electro-dynamometer in circuit remain the same, whether the current be continuous or irregular. The Deprez-Carpentier amperemeter shows indications 10 per cent. lower with irregular than with continuous currents. The indications of a Thomson voltmeter or a Deprez-Carpentier voltmeter mounted in derivation on the terminals of the machine are about 15 per cent lower with irregular than with continuous currents. This deviation is due to the fact that the indications of the amperemeter are proportional to the mean intensity, and that the square of the mean intensity introduced in the formula $W = RI^2$ to calculate the mean work per second, is always smaller than the mean of the square of the intensity, deduced from indications of the electro-dynamometer which represents the true expenditure of the lamp. In the voltmeter the same cause operates; but the divergence is increased by self-induction tending to enfeeble the mean current which traverses it, and to diminish its indications. M. Hospitalier concludes from his experiments that considerable errors are committed by calculating in watts the expenditure of incandescent lamps, fed by irregular currents, taking the product of the volts and amperes indicated by magnetic measuring apparatus standardized by continuous currents.



THE LITTLE GIANT BATTERY.

* * A putty of starch and chloride of zinc hardens quickly, and will last as a stopper of holes in metals for months.

* * A diamond field in Australia is being worked on a paying basis. The yield is about one carat to a load of wash, and this is sufficient to make big profits. The company also has the prospect of occasionally finding a big stone which would greatly increase its dividends. Thus far no large stones have been found, but in the African field there is seldom more than one large diamond in ten thousand. It costs about sixty cents to work a load of wash dirt, and if a single carat is found the net profit amounts to over four dollars.

* * In coating zinc with nickel by means of a galvanic current, the zinc must be first cleaned by diluted hydrochloric acid, and thoroughly washed. It is then hung in the nickel bath for a short time, taken out, rinsed, and thoroughly scraped, so as to remove all the metal that does not adhere firmly. This operation is repeated till the zinc is covered with a thin film of nickel, which can afterward be made as thick as required. The suitable current strength is easily found, and when the zinc is once thoroughly covered the current may be increased without risk of the nickel peeling off.

The Little Giant Battery.

Improvements in batteries for telephone, burglar alarm and annunciator use are of frequent occurrence. The Rhode Island Telephone and Electric Company, of Providence, have just brought out a battery, known as "The Little Giant," that for durability, compactness and strength is one of the best ever brought to our notice. Wherever the battery has been tried it has given perfect satisfaction, and it is particularly praised for its excellent work with the telephone. One cell has been found to be abundantly powerful enough to work an automatic gas burner, and four is the largest number ever required, although six of other makes are generally found necessary. This battery has been adopted as their standard by the Telegraphic Time Company, which fact is strong proof of its excellence. The jar can be sealed, should it be desired. We expect to see quite a demand for this new battery, as its value becomes known to the electrical field.

The Triple Thermic Motor.

People in Lowell continue to be considerably interested in the controversy over the merits of the triple thermic motor, and are still awaiting with curiosity the report of Professor John Trowbridge, of Harvard College. Soon after Professor Trowbridge sailed for Europe, it was announced in some of the Lowell papers that he had prepared a report, which showed that the claims of the motor people were "modest when compared with the facts." It was said that the text of this report could not be published, because of an arrangement by which Professors W. P. Trowbridge, of Columbia, and C. B. Richards, of Yale, were to make another test for a prominent business man of Boston. It was not best, the friends of the motor argued, to make public one report until all the tests had been made. Thereupon Professor Channing Whitaker—well known in Lowell and Boston as a former instructor at the Massachusetts Institute of Technology—wrote to the two professors the state of the facts, and received in reply a letter dated at New Haven, July 15, designed expressly for publication. The letter contained this paragraph:

> The statement that his report is withheld from the public until our tests shall be made, and the report of it published, has led us to notify the gentlemen who employed us that we withdraw from the matter, and that, therefore, we do not afford a bar to the immediate publication of Professor John Trowbridge's report. W. P. TROWBRIDGE,
> C. B. RICHARDS.

The field thus appears to be cleared for the publication of the text of Professor John Trowbridge's report, and people interested say that if it sustains the claims made for the motor, the motor people ought to be willing to publish it with alacrity. A reporter called on Mr. E. S. Mansfield at his office in

Boston, and asked him whether he was the attorney of the Colwell motor people. Mr. Mansfield stated that he represented the Triple Thermic Motor Company. The reporter asked when Professor Trowbridge's report would be published, expressing a desire to use an abstract of it or the essential portions of it as soon as it was ready. Mr. Mansfield declined to make any statement about the matter. The capital of the company has been fixed at $25,000,000. The sale of stock began as early as 1882, and an engine was set in operation in New York City in August, 1883. The New York engine has not recently been in operation, but one has been set up in a building on Jackson street, Lowell, and furnishes the current for a number of electric lights.

The Governor of Michigan for Electricity.

"I am strongly in favor of retaining the electric light for street illuminating purposes," said Gov. Alger, in answer to the inquiries of a reporter, "and I think it would be folly for a go-ahead city like Detroit to return to gas. I have been told that an advocate of the gas system informed an Alderman that the gas company did not expect to make anything by lighting the city, but that the company would lose $20,000 if the Council accepted their bid. That one statement appears to me, as a business man, to be the weakest point in their case. The city is well able to pay for all it gets and does not require a donation of $20,000 from the gas company or anyone else. Therefore if the company will lose $20,000 by lighting the city it is done for one of two purposes. Either to drive out the electric light and then say 'we can't afford to make a contract for another year at the old price,' thus being in a position to secure an advance, or to make up the loss by raising the price of gas furnished private consumers.

"As one of the latter I have a decided objection to being compelled to pay any more than I am now paying because I want a dollar's worth for my dollar. But that is not the chief objection to returning to the old system. If the electric light company is driven out now it is only a question of time when it will cost as much to light the city with gas as it does under the present system and as the city can afford to pay a good round sum for a good light let us have the best of the two and stick to electricity."

The Leclanche Disque Cell.

We illustrate the Leclanche Disque Cell complete on this page. The Leclanche Battery Company have exclusive right to the trade mark "Gonda," which now appears on every genuine Leclanche battery, and on these alone. This battery is first-class in every respect and is one of the most popular and efficient ever constructed. It is particularly adapted for telephone use, and years of trial in this field have failed to discover any defects. The battery with trade-mark and label as shown in the cut is the genuine Leclanche battery as now manufactured by the Leclanche Battery Company, 149 West 18th street, this city. This company report sales excellent at the present, and the demand for the battery in this country and Europe steadily increasing.

Advance in Metals.

One of the phenomena of the unprecedented accumulation of idle capital which is distrustfully held out of speculation or any new enterprises, is its investment in certain kinds of commodities which can be carried without much expense and with but little risk of damage from fire, or flood, or theft, or any of the ordinary causes of the destruction of wealth. Of this class of commodities are the metals, and in these capital is seeking investment, not only for the reason above cited, but because they are below the average prices of years. Lately there has been considerable advance in the price of tin as the result of this kind of investment, and the same thing is in progress in copper, antimony, and just now, particularly, lead. The manufacturers and workers in these metals have all been doing a comparatively profitable business in the last year or two because they have been getting nearly the same prices for manufactured work, while the raw materials have been selling at unprecedented low prices, and they are all ready to cry "corner" now when capital begins to find the metals an attractive investment and advances their prices.—*Chicago Journal of Commerce.*

—— The people turned out in great numbers to witness the opening of the electric light system at Woburn, Mass., many coming from out of town. There were differences of opinion regarding the light, but the prevailing opinion was that it was a great success, and Mr. Simonds, the proprietor, was congratulated on all sides for his public spirit in furnishing the light.

—— Messrs. R. E Fletcher & Co., of Otago, New Zealand, have just constructed an electric search light to be used in connection with the arrangements for the defence of Auckland Harbor. Similar lamps are to be prepared for the other principal ports of the colony. The one already manufactured was tested from the heights near Otago, and acted satisfactorily, the light being projected forward in a steady, powerful stream by means of a 22-inch parabolic silvered reflector. The lamp is what is known as "band focussing," and is provided with universal motion, so that it can be turned at pleasure by hand in any direction.

—— The Kauffer & Soldner primary battery for incandescent electric lighting, of which a test of 150 hours' continuous successful work was concluded at six o'clock Monday morning, is still in operation at 51 State street, Boston. It was found, on removing the seal, that the solution was still good for the purpose of producing a current sufficient to produce incandescence in carbon filaments, and at 11 A.M. on Monday the current was again started up for continuous service, with the old existing solution unrenewed, and at 11 o'clock in the forenoon, after 24 hours' continuous illumination, the battery was still giving a current sufficient for two small incandescent lamps.

THE LECLANCHE BATTERY.

—— One of the most pleasant and beneficial health and summer resorts is the Los Vegas Hot Springs, on the line of the Atchison, Topeka and Santa Fe Railway, where the Montezuma Hotel furnishes food and comfort to hundreds of guests. This magnificent building is fitted up with beautiful electroliers and fixtures from the leading house of Mitchell, Vance & Co., of this city, and the system of lighting used is that of the United States Electric Lighting Company. There are over 1,000 incandescent lights in use in the hotel, and its appearance of an evening, standing out on the mountain side 7,000 feet above the level of the sea, is very brilliant and attractive. The effect on suddenly coming in sight of the Montezuma Hotel is startling, as one does not expect to meet with such evidences of civilization so near the abode of the Pueblos and Montezumites.

—— The City of Rome, Inman line, has adopted the Remington system of electric lighting. A plant of 40 lights is now being constructed there.

—— Marlboro, Mass., expects to rejoice in the Schuyler electric light within the next thirty days, as arrangements have already been completed for its immediate introduction, the steam-power being leased, and subscribers to a sufficient number of lights on yearly contracts have been secured to make a paying investment of the stock.

—— A decided victory has been scored by the Brush Company at Detroit, Michigan, the City Council accepting this company's proposition to light the city by a vote of 17 to 8. There had been considerable discussion over the question of lighting, and a few favored going back to gas, but the citizens would not have it, and the result as stated, is a well deserved compliment to the present excellent Brush system, which will now be continued.

—— Three of the electric light towers in Danbury, Conn., erected by the Schuyler Electric Light Co. are completed, and the other will be finished and put up by the first of next week. The Schuyler Company will ship their machines for lighting the city of Danbury, in accordance with their five years' contract from that borough, this week, and the lights will probably be started early next week. This will be the first city in New England using the electric towers for universal lighting. These four towers will take the place of all the gas and naphtha lamps in the city of Danbury.

—— The new clock dials on the tower of the General Post Office at Melbourne, Australia, will be made of cast iron having hemispherical recesses so placed as to mark the hours, instead of the usual numerals. These cups will be nickel plated inside, so as to reflect the sunlight, forming bright points during the daytime. After dark, each will be illuminated with an incandescent lamp, and on each of the hands will be placed a close row of smaller lamps. By this arrangement it is believed that it will be possible to read the time at a great distance.

—— The authorities of Oswego, N. Y., where the Remington system of electric light is in use, recently advised a neighboring city to adopt that system in the following letter: "Your favor of the 17th instant relative to electric light received and handed me for reply. The Remington lights give us entire satisfaction. We think we have as good, if not the best light in use. We are told so by strangers and traveling men, who have the best opportunity to see the different lights. Twenty of our Remington lights displace 129 gas jets. If you want a good light, get the Remington."

—— The City Council of Winona, Minn., closed with G. S. Bowen, of Elgin, Illinois, to light the city for five years with sixty electric lights. He agrees to settle the old matter now in controversy, and purchase the Van Depoele plant now owned by the city. It is the intention to put in an additional plant for lighting stores, etc. Nearly all of the subscribers wanted for lighting buildings have been obtained, there being only some ten more lights to be placed to take the full capacity of the machines. The plant is to be run at the city water-works, where now located.

—— The Detroit *Free Press* in speaking of the controversy over the question of city lighting (which resulted in favor of the Brush Company) has the following: "As the contest between electricity and gas-naphtha draws to a conclusion, public interest in the controversy remains unabated. Confronted with the possibility of a return to old fogy methods, citizens have become aroused, and are expressing themselves in emphatic terms. Gov. Alger's remarks to a reporter of the *Free Press*, published in last Sunday's edition, voice the general public sentiment, particularly among business men. A pretence of self sacrificing generosity is particularly suspicious, coming from a gas company, and the public are apt to mistrust ulterior motives."

ELECTRIC LIGHT NEWS

—— Electric Light is being introduced into Hornersville, N. Y.

—— The Baumgarten Restaurant, near Vienna, has received an installation of Klostermann arc lamps.

—— The Bazin rotative bichromate battery has been designed by the inventor for the purposes of domestic lighting.

—— The Polytechnic Building, St. Louis, has ordered 450 incandescent lights of the United States Electric Light Company.

—— The inauguration of electrical illumination at the Bibliotheca Nacional, Rio De Janeiro, took place on the evening of the 1st inst.

—— The electric lighting systems—both arc and incandescent—are fast working their way into general adoption, and many years will not elapse before their use will be universal.—*Boston Herald.*

—— Weather vanes illuminated by electricity, so as to be visible at night, have been suggested. These would help the wayfarer when a few "sheets in the wind" to observe which way it blew.

—— A successful installation of a 200-light incandescent plant has been put in the College of Ottawa, Ont. This is the first educational institution in Canada to adopt the electric light.

—— The Troy electric light station of the United States' system is said to be very complete. There is quite a demand here for the incandescent light for private use, and 50 arc lights have been placed in the different establishments.

—— The Allentown Electric Light Company, of Allentown, Penn., has just installed the first of its thirty-light full arc machines ordered of the Schuyler Electric Light Company, which will replace the system heretofore used by that company.

—— The Washington electric light station, which was burned down recently, is now all right again, the company having promptly put in new machinery in a convenient location, and in less than a week had all the lights burning. The system is the United States.

—— The Williamsburgh Athletic Club (Brooklyn) have their well-appointed grounds lighted by electricity, by the light of which their athletic sports are carried on. The grounds are brilliantly illuminated. The club is one of the strongest in the country, having a membership of 1,200.

—— During the past six months the Guatemala Electric Light Company has installed 300 arc lights in that city. This company adopted the system of the Thomson-Houston International Electric Company, of Boston, Mass., U. S. A, and now have the largest installation of arc lights in South America.

—— According to experiments thus far, says *Dingler's Journal*, there is no evidence of the development of electricity during the conversion of water into steam, and even upon quiet electrified surfaces the steam arising is electrically neutral; nor is electricity developed by the condensation of atmospheric vapor.

—— When all the lights now contracted for in Brooklyn are put up, there will be 255 of 1,200 candle-power each. The chief streets in which they will take the place of gas are portions of Atlantic avenue, Myrtle avenue, Bedford avenue, Fulton street, Court street, Broadway, Washington avenue, First and Fourth streets, E. D., Manhattan avenue, Grand street and Graham avenue. In all, over 1,800 gas-lights will be dispensed with. As soon as possible, the whole city will, no doubt, be illuminated with the new light, and the deeds which love darkness will be less frequent.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 21, 1885.

322,417 Thermostat for Fire Alarms; John J. Byrne, Chicago, Ill.

322,427 Synchronous telegraphy; Patrick B. Delaney, New York, N. Y., assignor to the Standard Multiplex Telegraph Co., same place.

322,474 Electric signal apparatus; Myron W. Parrish, Detroit, and Marcus F. Parrish, Niles, assignors of one-third to Horace B. Peck, Allegan, Mich.

322,494 Sparkless circuit-breaker; Louis H. Spellier, Philadelphia, Pa.

322,496 Multiple incandescent electric lamp; Wm. Stanley, Jr., Pittsburgh, Pa.

322,498 Incandescent electric lamp; Phillip K. Stern, Toronto, Ontario, Canada.

322,515 Apparatus for suspending arc lamps; John Young, Chicago, Ill., assignor to the Western Electric Co., same place.

322,517 Electric railway; Edward M. Bentley, Brooklyn, N. Y.

322,529 Underground conduit; Daniel H. Dorsett, Chicago, Ill.

322,612 Electric thermostat; C. Edmund Kells, Jr, New Orleans, La.

322,619 Indicator for electric bell circuits; Wm. A. Leipner and Chas. Brotherhood, Clifton, County of Bristol, England.

322,681 Electric door-opener; Thomas A. Casey, New York, N. Y., assignor to J. H. Bunnell & Co., same place.

322,688 Receiving apparatus for synchronous telegraphs; Patrick B. Delaney, New York. N. Y., assignor by mesne assignments to the Standard Multiplex Telegraph Co., same place.

322,689 Printing device for synchronous telegraphy; Patrick B. Delany, New York, N. Y, assignor by mesne assignments to the Standard Multiplex Telegraph Co., same place.

322,690 Means for effecting electrical synchronous movements; Patrick B. Delany, New York, N. Y., assignor by mesne assignments to the Standard Multiplex Telegraph Co., same place.

322,691 Method of effecting electrical synchronous movements; Patrick B. Delany, New York, N. Y, assignor by mesne assignments to the Standard Multiplex Telegraph Co., same place.

322,692 Means for electrically maintaining synchronous movements; Patrick B. Delany, New York, N. Y., assignor by mesne assignments to the Standard Multiplex Telegraph Co., same place.

322,693 Printing telegraph for synchronous telegraphy; Patrick B. Delany, New York, and Edward A. Calahan, Brooklyn, assignors to the Standard Multiplex Telegraph Co., New York, N. Y.

322,694 Means for regulating the vibrations of forks, reeds, etc.; Patrick B. Delany, New York, N.Y., assignor to the Standard Multiplex Telegraph Co, same place.

322,695 Means for mechanically correcting the vibrations of reeds and forks; Patrick B. Delany, New York, N. Y., assignor to the Standard Multiplex Telegraph Co., same place.

322,696 Means for actuating and correcting the vibration of reeds; Patrick B. Delany, New York, N.Y., assignor to the Standard Multiplex Telegraph Co, same place.

322,724 Apparatus for suppressing induction disturbances; Wm. A. Jackson and Josephus C. Chambers, Detroit, Mich., assignors to Geo. H. Lothrop, trustee, same place.

322,725 Neutralizing coil; Wm. A. Jackson and Josephus C. Chambers, Detroit, Mich., assignors to Geo. H. Lothrop, trustee, same place.

322,726 Means for suppressing induction: Wm. A. Jackson and Josephus C. Chambers, Detroit, Mich., assignors to Geo. H. Lothrop, trustee, same place.

322,727 Induction neutralizing coil; Wm. A. Jackson and Josephus C. Chambers, Detroit, Mich., assignors to Geo. H. Lothrop, trustee, same place.

322,728 Process of neutralizing induction; Wm. A. Jackson and Josephus C. Chambers, Detroit, Mich., assignors to Geo. H. Lothrop, trustee, same place.

322,739 Quadruplex telegraph; Leon O. McPherson, Jefferson Township, Cook County, Ill.

322,744 Holder for incandescent electric lights; O. A. Moses, New York, N. Y.

322,745 Electric switch; Edmund B. Nicolaus, Cleveland, Ohio.

322,808 Relay for synchronous multiplex telegraphy; Patrick B. Delany, New York, N. Y., assignor to the Standard Multiplex Telegraph Co., same place.

322,809 Means for actuating and correcting the vibrations of forks, reeds, etc., Patrick B. Delany, New York, N. Y., assignor to the Standard Multiplex Telegraph Co., same place.

322,835 Signal call for telephone offices; Albert H. Low, Denver, Col.

322,857 Electric switch; Frederic Schaefer, Boston, Mass., assignor by mesne assignments to Leopold Schlegelmilach, trustee, same place.

322,859 Electric Railway; Ernst W. Siemens, Berlin, Germany.

322,884 Telephone receiver; J. Ensign Fuller, Chicago, Ill.

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